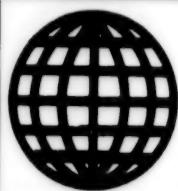


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3 May 1994



**FOREIGN
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JPRS Report

Science & Technology

China

Science & Technology China

JPRS-CST-94-007

CONTENTS

3 May 1994

Science and Technology

Science and Technology Policy

China To Nurture Its Own Electronics Giants [Pei Jianfeng; CHINA DAILY, 4 Apr 94]	1
Organizational Changes in Ministry of Electronics Industry [ZHONGGUO DIANZI BAO, 1 Oct 93]	1
Provisional Regulations for Importing, Exporting S&T Products by Scientific Research Institutions [Ministry of Foreign Trade and Economic Cooperation and State Science and Technology Commission; KEJI RIBAO, 6 Oct 93]	3
CAS Formulates Measures To Protect Intellectual Property Rights [Wang Daitong and Yan Yan; KEJI RIBAO, 6 Oct 93]	4
High-Tech Campaign Bears Fruit [CHINA DAILY, 4 Apr 94]	5

Advanced Materials and Superconductivity

Latest Reports on Nanomaterials	6
Phase Transformation From Amorphous Alloys Into Nanocrystals [Lu Ke; JINSHU XUEBAO, No 1, Jan 94]	6
Structure, Properties of Nanocrystalline Fe-Cu-Nb-Si-B Alloys [Zhi Jing, He Kaiyuan, et al.; JINSHU XUEBAO, No 2, Feb 94]	6
Mossbauer Spectroscopy of Nanocrystalline Fe-Cu-Nb-Si-B Alloys [Bai Kuichang, Jiang Ziyang, et al.; JINSHU XUEBAO, No 2, Feb 94]	7
Interfacial Excess Volume in Nanocrystalline Ni-P Alloys [Sui Manling, Lu Ke; JINSHU XUEBAO, Mar 94]	8
Domestically Made Nanodevices Inserted into Human Cell [Wang Yuhua, Chen Zhihong; WEN HUI BAO, 6 Apr 94]	8
China Claims World's First Two Space-Communications-Qualified HTS Antennas [Fan Jian; KEJI RIBAO, 8 Mar 94]	8

Biotechnology

Cloning and Expression of Coat Protein Gene of Soybean Mosaic Virus in Escherichia coli [Liu Junjun, Peng Xuexian, et al.; SHENGWU GONGCHENG XUEBAO, No 3, Aug 93]	9
High Level Expression of Human Prourokinase cDNA in Chinese Hamster Ovary (CHO) Cells [Cheng Dusheng, Yu Weiyuan, et al.; SHENGWU GONGCHENG XUEBAO, No 3, Aug 93]	9
Determination and Analysis of Nucleotide Sequence of Plasmid pXZ10145 [Shen Tianxiang, Jia Panxing, et al.; SHENGWU GONGCHENG XUEBAO, No 3, Aug 93]	9
Electroporation of Foreign DNA Into Escherichia coli Using Chinese-Made Gene Pulser [Song Shiduo, Zhang Tonghai, et al.; SHENGWU GONGCHENG XUEBAO, No 3, Aug 93]	9
Electrofusion of Protoplasts From Aspergillus Niger [Zhou Zhenghong, Fang Shankang; SHENGWU GONGCHENG XUEBAO, No 3, Aug 93]	9
High Level Expression of ipaBC Gene From Shigella flexneri 5M90T and Investigation of Their Immunoprotective Response in Mice [Rui Xianliang, Xu Yongqiang, et al.; SHENGWU GONGCHENG XUEBAO, No 3, Aug 93]	10
High Level Expression of HBV X Gene in Escherichia coli and Detection of Anti-HBx Antibodies in Sera of Patients With Liver Diseases [Tong Yigang, Huang Yaoyuan, et al.; SHENGWU GONGCHENG XUEBAO, No 3, Aug 93]	10
Production of Interferon α A by Escherichia coli W 3110 (pEC 901) [Kang Fengxian, Ye Qin, et al.; SHENGWU GONGCHENG XUEBAO, No 4, Nov 93]	10
Liquid Exchange and Oxygen Transfer Models in CellCul-20A Bioreactor [Wang Sijing, Chen Yinliang, et al.; SHENGWU GONGCHENG XUEBAO, No 4, Nov 93]	10

Study on Rotary-Tray Fermenter for Solid State Culture Applying the Single Cell Protein Production [Ma Guirong, Zhang Yuzhen, et al.; SHENGWU GONGCHENG XUEBAO, No 4, Nov 93]	10
Antibody-Mediated Early Death in Mice Infected With the Virus of Hemorrhagic Fever With Renal Syndrome [Yao Chuzheng, Huang Lili, et al.; ZHONGHUA WEISHENGWUXUE HE MIANYIXUE ZAZHI, No 1, Feb 94]	11
The Pathogenesis of Shigella species : Roles of Invasive Outer Membrane Proteins and O Antigen in the Entry Process [Zhang Rongping, Chen Enlin; ZHONGHUA WEISHENGWUXUE HE MIANYIXUE ZAZHI, No 1, Feb 94]	11
Effect of L-Isoleucine and Glycine on Catechol 2,3-Dioxygenase Expression and Excretion in Escherichia coli [Xia Dongxiang, Wang Meixian; WEISHENGWU XUEBAO, No 1, Feb 94]	11
Cloning and Expression of Yeast PHO81 Gene [Chen Jinlian, Wu Jiansheng, et al.; SHENGWUHUAXUE YU SHENGWUWULI XUEBAO, No 1, Jan 94]	12
Change of Pulmonary Beta-Adrenergic Receptor and Its Relation to Metabolism of Membranous Phospholipids During Endotoxin-Induced Rat Lung Injury [Sun Gengyun, Mao Baoling, et al.; ZHONGGUO YINGYONG SHENGLIXUE ZAZHI, No 1, Feb 94]	12

Computers

Latest Reports on Domestic Databases	12
Nationwide Electronics Industry DB [Wang Hao; ZHONGGUO DIANZI BAO, 11 Mar 94]	12
Shanghai S&T Tracking DB [Chu Nailiang; WEN HUI BAO, 17 Mar 94]	12
China S&T Information DB [Unattributed; KEJI RIBAO, 3 Apr 94]	13
DB a Boon to Information-Hungry Businesses [Xiao Gao; CHINA DAILY (BUSINESS WEEKLY), 4 Apr 94]	13
Latest Reports on U.S. Software Firms in China	13
DEC Markets First Software Frames [Li Qingbo; KEJI RIBAO, 15 Mar 94]	13
CASC, CV Establish Joint Venture [Xiao Bo; KEJI RIBAO, 2 Apr 94]	13
Microsoft Puts Heat on Software Makers [Xiao Pei; CHINA DAILY (BUSINESS WEEKLY), 4 Apr 94]	13
Wordperfect Corp Makes Market Bid [Lao Chen; CHINA DAILY, 23 Apr 94]	14
Two U.S. Firms Sign Deals with East China Computer Institute [Unattributed; CHINA DAILY (BUSINESS WEEKLY), 18 Apr 94]	14

Factory Automation and Robotics

Latest Reports on Sophisticated Robots	15
Remote-Controlled Robot for Nuclear Environments [Li Beidou; KEJI RIBAO, 22 Mar 94]	15
Nation's First Neural-Net-Controlled Robot [Li Wei; KEJI RIBAO, 26 Mar 94]	15

Lasers, Sensors, Optics

Development of Picosecond Photoconductive Switches, Application to Ultra-Wideband Radar [Yuan Naichang, Ruan Chengli, et al.; DIANZI KEJI DAXUE XUEBAO, No 6, Dec 93]	15
Room-Temperature CW 1.48-Micron Single-Quantum-Well Laser Fabricated by LPE [Yang Zhijian, Dang Xiaozhong, et al.; ZHONGGUO JIGUANG, No 1, Jan 94]	16
LD-Pumped Nd:YAG Microchip Laser With 62.5-mW CW Output Power [Shan Zhenguo, Shen Xiaohua, et al.; ZHONGGUO JIGUANG, No 1, Jan 94]	16

Microelectronics

Analysis of 1994 Domestic IC Market [JINGJI RIBAO, 7 Mar 94]	17
Development Status of Domestic LCD Industry [ZHONGGUO DIANZI BAO, 7 Mar 94]	17
LIGA Micromachining Advances Reported by Hefei State Synchrotron Radiation Laboratory [Nai Xin; ZHONGGUO KEXUE BAO, 14 Mar 94]	18

Domestic 400-MHz High-Write-Speed Oscilloscope Unveiled [Meng Xin; ZHONGGUO DIANZI BAO, 11 Mar 94]	18
Intel, Huajing Group Form Joint Venture to Produce CPU Chips [Ji Hongguang; KEJI RIBAO, 31 Mar 94]	18
National Semiconductor to Set Up Office, Joint Venture in China [Chen Jian; KEJI RIBAO, 15 Mar 94]	18

Telecommunications

Construction of Information Highway Seen as National Priority [Xie Ning; KEJI RIBAO, 4 Mar 94]	19
First Domestic Soliton Communications Experiment Reported by Qinghua University [Fan Jian; KEJI RIBAO, 25 Mar 94]	19
Beijing to Build Asia's First 800-MHz All-Digital Trunking Communications Network [Wei Quan, Wang Zhong; ZHONGGUO DIANZI BAO, 28 Mar 94]	19
Telecom Supplier Wants Piece of 'Huge' Market [Zheng Jie; CHINA DAILY, 4 Apr 94]	20
Development of Prototype Ku-Band Satellite-Borne 4-Feed Shaped-Beam Antenna [Bu Binlong, Zhong Ying, et al.; ZHONGGUO KONGJIAN KEXUE JISHU, No 6, Dec 93]	20

Physics

Radioactive Secondary Nuclear Beam Apparatus Built	25
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Energy

National Developments

1993 Capital Construction Investment in Electric Power [GUANGMING RIBAO, 3 Mar 94]	27
1993 Power Production [GUANGMING RIBAO, 1 Mar 94]	27
State Set To Expand Exploration for Energy [Pei Jianfeng; CHINA DAILY, 19 Mar 94]	27
ABB To Invest \$500 Million in Country's Power Sector [Hong Xia; CHINA DAILY, 21 Mar 94]	27
Major Construction, Investment in Jiangsu, Anhui, Zhejiang [Zhang Ke; JIEFANG RIBAO, 5 Jan 94]	28
Zhejiang Takes Steps To Address Energy Shortage [Yang Xianmin, Huang Dengxia; ZHEJIANG RIBAO, 28 Jan 94]	28
Guizhou's Strategic Energy Goal: Completion of Southern Energy Base [Zhang Junyan; GUIZHOU RIBAO, 17 Feb 94]	28
Henan Has 20-Percent Power Shortfall; 15 Million Without Electricity [Yu Liankui, Hao Xincui; GUIZHOU RIBAO, 25 Feb 94]	29

Hydropower

Work Begins on Dachao Shan—Project Is Crucial to Development of Lancang Jiang Power Base [Liu Liu, Lu Jianhua; YUNNAN RIBAO, 29 Dec 93]	29
Fast Action Urged on 200MW Yellow River Station [CHINA DAILY, 28 Mar 94]	30
Agreement With Austria on Hubei Hydropower Station [Li Zhengping; JINGJI RIBAO, 26 Jan 94]	30
Work on Longtan To Begin; Station Will Be Asia's Second Largest [Heng Zhicheng; RENMIN RIBAO OVERSEAS EDITION, 16 Feb 94]	31
Li Peng Underscores Importance of Rural Hydropower Electrification Program [RENMIN RIBAO, 27 Feb 94]	31

Thermal Power

Hainan's Nanshan Plant Ready To Generate Power [Zhou Bing; RENMIN RIBAO OVERSEAS EDITION, 22 Feb 94]	31
Jiangsu's Changshu Plant Adds Another 300MW Unit to Grid [WEN HUI BAO, 3 Mar 94]	31

Coal

Foreign Investors Sought To Help Clean Coal Project [Chang Weimin; CHINA DAILY, 21 Mar 94]	31
Coal Market Outlook for 1994 Reviewed [Xie Ranhao; JINGJI RIBAO, 31 Jan 94]	32
Prospects for Coal-Dressing in a Market Economy [Yu Ertie; MEITAN KEXUE JISHU [COAL SCIENCE AND TECHNOLOGY], Vol 22 No 1, Jan 94]	32

Oil, Gas

Joint Exploration Underway To Exploit Offshore Oil [Chang Weimin; CHINA DAILY, 7 Mar 94]	35
Amoco Seeks Investment Opportunities in China [Chang Weimin; CHINA DAILY, 19 Mar 94] ..	36
BP, Japanese To Begin Seismic Tests in Tarim [CHINA DAILY, 28 Mar 94]	36
1993 Oil, Natural Gas Production Exceed State Plan [Fei Weiwei; RENMIN RIBAO, 15 Jan 94]	36
Erlan Tops 1 Million Tons for Third Consecutive Year [Han Yuantao; RENMIN RIBAO, 3 Jan 94]	37
Mianyang Develops LNG Vehicle [He Wang; SICHUAN RIBAO, 3 Jan 94]	37
Breakthrough in Northern Shaanxi Oil and Gas Development [Wang Baishun, He Tao; SHAANXI RIBAO, 16 Jan 94]	37
Gansu Field Tops 1 Million Tons in '93 [Di Guanglong; GANSU RIBAO, 21 Jan 94]	38
Status, Outlook for Gasoline for Vehicular Use [Bian Aihua; ZHONGGUO NENGYUAN, No 12, 25 Dec 93]	38
Industry Offers 1994 Stable Production Plan [Zhang Chaowen; RENMIN RIBAO, 21 Jan 94]	39
Preparation Work Proceeds on Largest Offshore Gas Field [Chang Sheng, Wei Xuan, et al.; RENMIN RIBAO OVERSEAS EDITION, 16 Feb 94]	39
Agreement With Italy, France on Southeastern Tarim Oil [Qin Jingwu; RENMIN RIBAO OVERSEAS EDITION, 9 Feb 94]	40
Seven Countries In On East China Sea Bidding [Yu Man, Feng Jinhai; ZHEJIANG RIBAO, 5 Jan 94]	40
Rich Oil and Gas Deposits in Nansha Islands [FUJIAN RIBAO, 15 Feb 94]	40

Nuclear Power

S&T Resources Pooled To Develop 600MW Nuclear Power Plants [Cao Yuhe, Wang Baoan; JIEFANG RIBAO, 5 Jan 94]	41
Nuclear Safety Inspection System Takes Shape [Zhou Zhifang, Deng Ying, RENMIN RIBAO OVERSEAS EDITION, 7 Feb 94]	41
Guangdong Governor Announces Plans for Second Nuclear Power Plant [Wang Sheng; RENMIN RIBAO OVERSEAS EDITION, 23 Feb 94]	41

Alternative Energy

Taking Steps To Rapidly Develop New Energy Technology [Wang Changgui; XIN NENGYUAN, Vol 16 No 1, 5 Jan 94]	42
Asia's Largest Wind Power Field To Be Built in Guangdong [RENMIN RIBAO, 17 Mar 94]	46

Science and Technology Policy

China To Nurture Its Own Electronics Giants

4010051A Beijing CHINA DAILY (BUSINESS WEEKLY) in English 4 Apr 94 p 1

[Article by Pei Jianfeng]

[Text] To build the electronics industry into a pillar of the national economy, China is trying to create its own electronics titans.

According to the ambitious plan, next year the country will have two or three electronics giants with annual revenues exceeding 5 billion yuan (\$575 million).

By the year 2000, several big Chinese manufacturers will edge into the world's top 100 electronics companies with annual sales surpassing 30 billion yuan (\$3.45 billion), said Lin Yuanfang, deputy director of the Department of Economic Operation and Structural Reform under the Ministry of Electronics Industry.

"This is a major move to improve domestic companies' global competitiveness and deal with the business challenges that will follow China's re-entry into GATT," Lin said.

If China rejoins the General Agreement on Tariffs and Trade (GATT), Chinese companies will have to compete with vigorous competitors from abroad.

There are now more than 18,000 electronics enterprises in the country. But their combined output last year was only 175 billion yuan (\$20 billion), less than that of a global electronics giant.

To nurture China's own IBM or Sony, the ministry has selected some promising corporations for special help in development, Lin said.

The list includes the country's top eight electronics companies, each with 1993 revenues exceeding 2 billion yuan (\$230 million).

The Shanghai Audio and Video Ltd Co., with revenue last year of 3.57 billion yuan (\$410 million), is the country's largest electronics firm.

The Legend Computer Group, which was started in 1984 with 1.3 million yuan (\$149,000), ranks second with 1993 sales exceeding 3 billion yuan (\$345 million), including its overseas business.

It is estimated that Legend's revenues this year will surpass 5 billion yuan (\$575 million).

Lin said the electronics ministry encourages these companies to expand quickly by merging with and acquiring other enterprises and by diversifying their businesses.

China will also try to form some large corporations through key projects to develop products such as video cassette recorders (VCRs), mobile telecommunications equipment and high-definition television (HDTV), he said.

China Hualu Electric Group will be a model. By uniting suppliers of VCR components and assembly factories, the group's annual revenues will total 15 billion to 20 billion yuan (\$1.7 billion to \$2.3 billion).

Large high-tech industrial groups will be created through alliances of universities, research institutes and enterprises, Lin said.

The Founder Group, a software developer launched by Beijing University, also was chosen as a potential giant. It had sales last year of 944 million yuan (\$109 million).

Lin said that the ministry will provide preferential treatment to help these companies expand into conglomerates.

They will be given priority in receiving government investment and favorable treatment on taxation and land use, he said.

They will also be authorized to raise capital through various channels, including stock issues.

The ministry encourages them to expand business overseas and compete internationally, Lin said.

Organizational Changes in Ministry of Electronics Industry

94FE0123 Beijing ZHONGGUO DIANZI BAO [CHINA ELECTRONICS NEWS] in Chinese 1 Oct 93 p 1

[Article: "State Council Approves Internal Organizations Within Ministry of Electronics Industry, Ministry of Electronics Industry Appoints Work Personnel"]

[Text] According to Document 48 (1993) issued by the National Office of the State Council Office, the internal organizations of the Ministry of Electronics Industry have been approved.

The Ministry of Electronics Industry has 11 professional departments, bureaus, and related party committees.

1. Office Building Responsible for overall coordination of government affairs in the ministry's organs and ensuring effective operation of the ministry's organs; responsible for secretarial work for ministry leaders and organization document preparation, archiving, confidentiality, secrecy, security, letters and visits, news, information dissemination, and other work; directs Ministry of Electronics Industry propaganda work; responsible for offering proposals on principles, policies, and related legislation for development of the Ministry of Electronics Industry and for managing related legal and regulation activities; responsible for organization finances, capital construction property, and other administrative management work.

2. Comprehensive Program Department Organizes the formulation of Ministry of Electronics Industry development strategies, overall deployments, and industrial policies, organizes the compilation of medium and long-term development programs and annual plans for the Ministry of Electronics Industry (including military industry electronics development programs and capital construction, and annual technical upgrading plans); formulates the scale of capital construction and technical upgrading investments in the Ministry of Electronics Industry, organizes the absorption and utilization of foreign investments, examines over-quota capital construction and technical upgrading projects and offers project proposals, responsible for comprehensive balancing work for major projects; organizes the formulation of economic and technical indices and construction standards

and quotas for the Ministry of Electronics Industry; directs environmental protection in the Ministry of Electronics Industry.

3. Economic Operations and System Reform Department Formulates production and development objectives for the Ministry of Electronics Industry; organizes the compilation of annual production plans for key products and popular products; responsible for management of information and statistical work in the Ministry of Electronics Industry; coordinates with the related departments to develop the electronic products market and electronic products imports and coordinates the organization of international bid solicitation and bidding; directs system reform and enterprise management work in the industry; directs enterprise organizational structure readjustment and shareholder system trial point work.

4. Science and Technology and Quality Supervision Department Organizes the compilation of S&T development programs and special plans for the Ministry of Electronics Industry; responsible for establishing key S&T research and development projects and for coordinating, supervising, and promoting work to convert S&T achievements into commodities; directs intellectual property rights management and knowledge importing work in the Ministry of Electronics Industry; organizes construction and readjustment of scientific research and development systems; organizes the compilation of technical standards, quality standards, and specialized measurement inspection regulations for the Ministry of Electronics Industry and supervises their implementation; directs quality management and supervision work in the Ministry of Electronics Industry; organizes military industry electronics quality assurance system work and supervises its implementation.

5. Military Industry Department Organizes research to propose development strategies, programs, principles, and policies for the Ministry of Electronics Industry; responsible for comprehensive work in military industry electronics; organizes the compilation and assignment of directive-type plans for military industry new electronic equipment trial manufacture and production and supervises their implementation; organizes and coordinates development, production, and matching work for key systems equipment and basic products for military industry electronics.

6. Communication and Systems Equipment Department Does research to propose development directions, strategies, and policies for important electronics systems engineering, important equipment, and the communications equipment manufacturing industry; organizes and coordinates the state's development and full-process services of important electronic systems engineering and equipment projects.

7. Computer and Information Promotion Department Does research to propose development directions, strategies, and policies for the computer and software industries; organizes the compilation of electronic information technology extension and application programs and plans and supervises their implementation; responsible for organizational and project establishment work for electronic information technology extension and application loans; responsible for computer and software intellectual property rights protection management work; directs and coordinates development of the electronic information technical service industry.

8. Basic Products and Major Projects Department Organizes, coordinates, and supervises the implementation of micro-electronic and basic product major engineering projects; does research to propose development directions, strategies, and policies for basic electronic products and equipment used in the electronics industry itself; organizes and coordinates the extension, application, and industrialized large-scale production of microelectronic and emerging electronic basic products and new electronic materials.

9. Economic Regulation and State-Owned Property Supervision Department Participates in the formulation of all types of state economic policies and economic regulation measures related to the electronics industry; responsible for comprehensive management of special funds and financial management of scientific research expenditures and activity expenditures and for organization and implementation of the related policies; conducts supervision, examination, and evaluation to protect and increase the value of state-owned property in large-scale key electronics enterprises; supervises and manages state-owned property in institutional units under its jurisdiction.

10. Personnel Education Department Organizes the compilation of electronics industry cadre and skilled personnel training policies and measures. Organizes cadre exchanges and training, directs management work for specialized technical personnel in the industry; directs labor wage work in the electronics industry; responsible for organizational establishment of ministry organizations, job duties and division of labor, and job definition compilation management work; manages personnel and labor wage work for ministry organizations and units under their direct jurisdiction. Organizes the compilation of electronics industry educational activity development programs and plans and supervises their implementation, directs educational work in electronics specializations for all levels and all categories of colleges and schools in China and electronics industry employee education work; manages and directs students studying abroad and graduate student training for units under the jurisdiction of the ministry and degree awarding work; manages colleges and schools under the jurisdiction of the ministry; responsible for technical qualifications (levels) examination work for computer software specializations in China.

11. International Cooperation Department Does research to propose policies and regulations for economic and technical cooperation with foreign countries for the electronics industry and supervises their implementation, directs economic and technical cooperation and exchanges of the electronics industry with foreign governments and international organizations, works with the relevant departments to organize and coordinate electronic product export work; organizes work related to foreign countries for important technology importing projects and foreign investment utilization projects; manages foreign affairs administrative duties and foreign affairs activities for ministry organizations.

12. Organization CPC Committee Responsible for party and mass work in ministry organizations and units under their jurisdiction in Beijing (including discipline committee, labor union, and communist youth league work).

Does discipline inspections, supervision, evaluation and so on for accredited organizations, reserve forces, and elderly comrade service organizations and compiles and examines other unified provisions.

Additional Report The Ministry of Electronics Industry recently appointed responsible persons for the 11 professional departments and related CPC committees of the Ministry of Electronics Industry. They are: Office Building director Hu Peirong [5170 1014 2837], deputy directors Wang Zhongchen [3769 0112 5256] and Chen Dawei [7115 1129 5898]; Comprehensive Program Department director Wu Xiaolong [0702 1420 7893], deputy directors Yu Zhonghou [0060 1813 0624], Xu Shuncheng [1776 7311 2052], and Wang Jianzhang [3769 1696 4545]; Economic Operations and System Reform Department director Li Yuxiang [2621 3768 4382], deputy directors Lin Yuanfang [2651 0337 5364] and Ji Jinkui [1323 6855 1145]; Science and Technology and Quality Supervision Department director Li Houbin [2621 0624 7001], deputy directors Liu Hongkun [0491 3163 2492] and Zhang Haimen [1728 3189 7024]; Military Industry Department director Hou Yinming [0186 0603 7686], deputy directors Liu Xiaoying [0491 5135 5391] and Guo Youlu [6753 2589 3472]; Communication and Systems Equipment Department director He Feichang [0149 7236 1603], deputy directors Wang Zhigang [3769 1807 0474] and Wu Zhaoli [0702 0340 0500]; Computer and Information Promotion Department director Yang Tianxing [2799 1131 5887], deputy directors Chen Zhengqing [7115 2973 3237] and Zhang Qi [1728 3825]; Basic Products and Major Projects Department director Li Dasheng [6786 1129 0581], deputy directors Wang Guoguang [3769 0948 0342] and Zheng Minzheng [6774 2404 2398]; Economic Regulation and State-Owned Property Supervision Department director Wang Qinfang [3769 3830 5364], deputy director Qi Zhengrong [2058 2973 2837]; Personnel Education Department director Cheng Guanghui [4453 0342 6540], deputy directors Yao Zhiqing [1202 1807 3237] (main bureau), Zou Nairui [6760 0035 4213], and Zhang Zhengying [1728 2973 5391]; International Cooperation Department director Yang Shiliang [2799 0013 5328], deputy directors Tong Bao'an [0157 0202 1344] and Zhang Xuan [1728 6513]; Organization CPC Committee secretary Lu Xinkui [0712 2450 1145] (concurrent appointment), deputy CPC secretaries Su Longxing [5685 7127 5281] and Xu Yongge [1776 3057 7245].

Provisional Regulations for Importing, Exporting S&T Products by Scientific Research Institutions

94FE0124B Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 6 Oct 93 p 2

[Article by the Ministry of Foreign Trade and Economic Cooperation and State Science and Technology Commission: "Provisional Methods for Granting S&T Product Import/Export Rights to Scientific Research Academies and Institutes (5 October 1993)"]

[Text] **Article 1** These methods have been specially formulated to accelerate the commercialization and industrialization of S&T achievements, spur scientific research academies and institutes to become involved in foreign trade and international competition, and promote the development of foreign economic and trade activities in China.

Article 2 These methods are appropriate for all categories of independent scientific research academies and institutes including basic research in the natural sciences, applied research, technology development, and so on (abbreviated below as scientific research academies and institutes) that are involved in foreign economic and trade activities.

Article 3. Scientific research academies and institutes that apply for S&T product import/export rights (abbreviated below as import/export rights) should have the following conditions:

1. Relatively powerful technology and technical product research and development capabilities and substantial production capabilities. The technologies on which they do R&D and the technical products that they produce themselves should be internationally competitive.
2. Accomplishments in the areas of commercializing and industrializing S&T achievements and for 2 years prior to applying for import/export rights they have authorized their agents to export average yearly foreign exchange earnings (including the amount of technology exports) that are usually no less than \$500,000.
3. Facilities, capital, and other required conditions for undertaking import/export activities.

Article 4 Scientific research academies and institutes that are under the jurisdiction of enterprise groups that have already obtained import/export rights and other units already having import/export rights are not granted any further import/export rights.

Article 5 When applying for import/export rights, scientific research academies and institutes should submit the following materials:

1. Feasibility research reports, including scientific research and production capabilities, technical levels, and the situation in enterprises under their jurisdiction as well as a list of names of enterprises under their direct jurisdiction, enterprise legal person business licenses, and so on.
2. A list of the S&T commodities they plan to import or export and the scope of technology exports.

Article 6 When applying for import/export rights, scientific research academies and institutes should following the following procedures:

Scientific research academies and institutes under the direct jurisdiction of all departments of the State Council should submit a written request to their primary administrative department and the primary administrative department should send them to the State Science and Technology Commission and the Ministry of Foreign Economic Relations and Trade. Local scientific research academies and institutes should submit a written request to the Economics and Trade Department (Commission) and Science and Technology Commission of the province, autonomous region, municipality directly under the central government, or city with province-level economic decision-making authority in which they are located, and the Economics and Trade Department (Commission) and Science and Technology Commission are responsible for examining them and, after achieving a unanimous view, reporting them jointly to the State Science and Technology Commission and Ministry of Foreign Economic Relations and Trade.

After examining the scientific research academies and institutes reported by all departments and all regions, the State Science and Technology Commission will provide their views on the examination and send them in groups to the Ministry of Foreign Economic Relations and Trade. Based on the examination views of the State Science and Technology Commission, the Ministry of Foreign Economic Relations and Trade will conduct an examination and give an official response.

Article 7 In principle, import/export rights are granted to scientific research academies and institutes and do not give any additional approval for the establishment of new import/export companies. For those scientific research academies and institutes that already have enterprise legal person business licenses, the import/export rights are awarded directly to those units. For those scientific research academies and institutes that do not themselves have enterprise legal person business licenses, foreign business rights can be given to a fully-capitalized enterprise under ownership of the whole people stipulated by the unit according to the requests of the unit making the application.

Article 8 The rights and duties of scientific research academies and institutes that receive import/export rights are:

1. Within the approved scope of administration, to export technologies that the academy or institute has developed itself and S&T products that it produces itself, and to import the original and auxiliary materials, technologies, equipment, and components that the academy or institute requires for use in its scientific research and production.
2. To receive all preferential policies provided by relevant state stipulations in the area of import/export trade.
3. To enjoy the same rights in the area of professional exchanges and import/export trade that other self-managed import/export enterprises have.
4. To assume responsibility for the state's export foreign exchange earnings tasks and to maintain an appropriate rate of increase.
5. To respect the state's principles, policies, and all laws and regulations related to foreign economics and trade, to accept supervision, coordination, and management by state or local economics and trade departments, to serve the coordination of related import/export chambers of commerce, and to engage in business activities within the scope of their approved import/export activities. High and new technologies and products whose export is restricted by the state should be strictly managed in accordance with the related provisions.

Article 9 The separation, merging, changing of names, and so on of scientific research academies and institutes that have received import/export rights must be approved by the Ministry of Foreign Economic Relations and Trade and follow the procedures for making changes.

Article 10 If scientific research academies and institutes that have received import/export rights violate the state's stipulations regarding economic, technical, and trade relations with foreign countries, they will be punished according to the actual circumstances and may even have their import/export rights rescinded.

Article 11 Those scientific research academies and institutes that are unable for 3 years in succession to complete the state's export foreign exchange earning objectives will have their import/export rights rescinded.

Article 12 The Ministry of Foreign Trade and Economic Cooperation is responsible for interpreting these methods.

Article 13 These methods go into effect on the day they are promulgated.

CAS Formulates Measures To Protect Intellectual Property Rights

94FE0124A Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 6 Oct 93 p 1

[Article by reporters Wang Daitong [3769 0108 0681] and Yan Yan [2518 3601]: "Chinese Academy of Sciences Provides New Measures To Protect Intellectual Property Rights To Strengthen Technology Management and Prevent the Loss of Achievements"]

[Text] Leaders of many scientific research academies and institutes and enterprises are helpless when their units lose achievements, so the Chinese Academy of Sciences [CAS] is leading the way in creating a new route in China by formulating the "Stipulation of the Chinese Academy of Sciences To Protect Intellectual Property Rights". The CAS is now organizing all employees in units under its jurisdiction to integrate with implementation of the S&T Progress Law to conscientiously study this stipulation. Prior to the end of 1993, all employees of the CAS including personnel who have retired and those who have stopped working but retain their positions will sign a written pledge in their units that they will implement this stipulation.

The development of a socialist market economy and the operational mechanisms of "one academy, two systems" have compelled the CAS to adopt powerful and effective measures to protect intellectual property rights. When the CAS announced this stipulation at the beginning of 1993 it first clarified the scope of the academy's intellectual property rights: patented achievements, technical secrets, trademarks, commercial secrets, and scientific products that were accomplished in fulfilling tasks in their units, using the name of their units, using or mainly using the material conditions of their units, and other conditions.

This stipulation reinforces the academy's patent management. After scientific research work is completed, employees must accurately, completely, and immediately report their research achievement in written form to their units. Administrative departments of the units are responsible for examining whether or not it is necessary to apply for a patent for the achievement and immediately submitting those that should be reported for a patent, and only then can they publish an article or conduct an examination. For those cases in which it would not be best to apply for a patent but which do have commercial value, they should be protected as a technical secret of the unit. For those which were not reported immediately and which cause the unit to suffer a loss, besides eliminating the qualification of the achievement for submission to the academy for an achievement award, they must also seek out those with direct responsibility and those primary responsible persons in the unit.

Reinforcing the care of S&T information is an important aspect of this stipulation. After an employee completes a scientific research project in the CAS, they must turn over all their original materials to their unit's S&T archives department for archiving. Before leaving their unit, personnel who retire, leave while retaining their positions, resign, or are transferred out must turn over all of their information, equipment, materials, and products of the original unit where they were engaged in S&T work to the unit. There are also strict secrecy or protection measures for those who engage in scholarly exchanges and exhibitions in China and foreign countries and those who sign contracts with the outside. No person can personally published, reveal, utilize, or transfer the intellectual property rights of their unit.

Having rewards and punishments is one feature of this stipulation. It requires that bonuses and monetary awards be given to inventors and designers. In units that have not implemented this stipulation, the CAS will reduce allocations of preferential support funds to institute directors.

The written pledge that an employee signs with his unit states clearly that they must scrupulously abide by all the regulations in the "Stipulation" and that if they violate them they are willing to accept economic fines and administrative punishments and may have to assume legal responsibility.

In implementing this stipulation, each unit under the jurisdiction of the CAS establishes specialized personnel and specialized organizations to manage intellectual property rights and some have formulated concrete measures. Shanghai Organic Chemistry Institute has stipulated that the inventor of each patent is to be given a bonus of 1,000 yuan and that for those achievements that create good benefits, the inventor can receive monetary awards according to a specific proportion.

This CAS stipulation has had a rather significant impact inside and outside of the academy and some units have come to learn from it. Responsible comrades in the academy feel that this stipulation helps protect intellectual property rights and has created the conditions to prevent redundant research and raise invention starting points. People in the related legislative departments feel that it borrows from experiences in foreign countries in using internal contracts to protect intellectual property rights, especially for its effective attempts to protect non-patented professional inventions and is a solid measure with concrete aspects for implementing the S&T Progress Law.

High-Tech Campaign Bears Fruit

40100051B Beijing CHINA DAILY (BUSINESS WEEKLY) in English 4 Apr 94 p 7

[Text] The proliferating of high-technology companies in Beijing is proof that the municipal government's persistent efforts to promote high-tech industries are paying off.

Statistics show that Beijing had 4,443 high-tech enterprises last year, including 980 joint ventures. Their profits exceeded 11.3 billion yuan (\$1.3 billion).

Of these companies, 15 had revenues exceeding 100 million yuan (\$11.5 million) each and another 130 had profits above 10 million yuan (\$1.15 million).

As part of its campaign to foster general prosperity, the Beijing municipal government in recent years has stressed the exploitation of new and high technology.

The government encourages high-tech enterprises to use the joint-stock system to raise capital and to better adapt management to international standards.

The country's two leading high-tech enterprises, Stone Corp and Beijing Legend Computer Group Co., are listed on stock exchanges and have raised more capital for further development.

Beijing provides a solid foundation for the high-tech sector to burgeon. It has the country's greatest concentration of scientific institutes, universities and skills, plus the country's first technology-intensive scientific zone—Zhongguancun in Haidian District.

Success of the Beijing University Founder Group Co., which has quickly built itself a good reputation, is based on the scientific and technological strength of the country's top school of higher learning.

For instance, colour laser photo-composition technology developed by the company has ushered in a new era in printing the Chinese language, which has the world's most complicated written characters.

The company had record profits of 900 million yuan (\$103 million) in 1993 and is entering the vast domestic market for high-tech electrical telecommunications equipment.

Considered a "dark horse" by competitors, Lantong Electronics Co. Ltd in the Beijing High-tech Experimental Development Zone has almost overnight taken 60 per cent of the domestic market for display screens. Aggregate sales have soared to 100 million yuan (\$11.5 million) from 16 million yuan (\$1.8 million) last year.

Collective or individual high-tech enterprises founded by State scientific research institutes and universities have also shown great vitality.

The Huasheng Computer Co. Ltd, under a department of the Ministry of Electronics Industry, has become a big profit earner with yearly income of 300 million yuan (\$34.5 million).

More than 100 inventions and technological achievements of the Violight Group Co. of Qinghua University, the country's leading school for the natural sciences, are being used in industry.

According to reliable sources, the municipal government plans to promote new high-tech zones that have gradually taken shape, including a land information centre in Haidian District and two science and technology zones in Changping and Fengtai districts.

A technology development zone in Qinghua University and a biological garden in Beijing University will soon be set up. (Xinhua)

Advanced Materials and Superconductivity**Latest Reports on Nanomaterials****Phase Transformation From Amorphous Alloys Into Nanocrystals**

94P60193A Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 30 No 1, Jan 94 pp B1-B21

[Article by Lu Ke [4151 2688] of the National Key Laboratory for RSA (Rapidly Solidified Non-Equilibrium Alloys), Institute of Metals Research, CAS, Shenyang: "Phase Transformation From Amorphous Alloys Into Nanocrystalline Materials," supported by grants from NSFC and the CAS Excellent Foreign Student Fund; MS received 22 Jul 93]

[Abstract] Polycrystalline materials with nanometer-sized grains, also called nanocrystalline materials, can be synthesized by crystallization of amorphous alloys. This new method for preparation of nanocrystalline materials has drawn intensive investigation in recent years. A review is conducted of the synthesis method and transformation process from amorphous to nanocrystalline phases, including transformation kinetics, thermodynamics and transformation mechanism.

The author's particular interests are the microscopic mechanism of ordered atomic-cluster shear deposition and development of the amorphous crystallization technique—i.e., crystallization of amorphous alloys to generate ultrafine polycrystalline materials with nanocrystalline particles. The technique consists of isothermal annealing, taking the amorphous samples relatively quickly (100K/min) up to the annealing temperature, where they are completely crystallized in a protective atmosphere at a temperature maintained for a fixed time. The samples are then cooled to room temperature to produce the nanocrystalline materials. With this technique, the author and his colleagues have fabricated a variety of nanocrystalline samples—Ni-P, Fe-Si-B, Fe-Mo-Si-B, Fe-B, Co-Zr, and Fe-Co-Zr—in a series of metal-metalloid (TM-M) and metal-metal (TM-TM) alloys. The technique is relatively simple and low in cost, and permits easy control of crystal granularity. The author and colleagues have published numerous studies on these nanocrystalline materials, including defects and their distribution, thermal stability, mechanical performance, electromagnetic performance, and thermal performance.¹¹⁻³³ 27 figures, 2 tables, not reproduced.

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Structure, Properties of Nanocrystalline Fe-Cu-Nb-Si-B Alloys

94P60193B Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 30 No 2, Feb 94 pp B61-B65

[Article by Zhi Jing [2535 7231], He Kaiyuan [0149 7030 0337], et al. of the Department of Materials Science and Engineering, Northeastern University, Shenyang: "Microstructure, Magnetic Properties of Nanocrystalline (Fe,Cu,Nb)_{77.5}Si_{22.5-x} Alloys," supported by grants from NSFC, the CAS Institute of Metals Research's National Key Laboratory for RSA, and the CAS Institute of Physics' Magnetism Open Laboratory; MS received 30 Jan 93, revised 25 Jun 93]

[Abstract] Nanocrystalline (12-15-nm grain size) Fe_{74.5}Cu₁Nb₂Si_xB_{22.5-x} (x = 9.5-17.5) alloys are fabricated from the corresponding amorphous alloys by annealing at 540°C for 1 hour under a protective N₂ atmosphere. Curie temperature and lattice constants of these nanocrystalline alloys are found to decrease linearly with increase of total Si content x. The Si content in the crystallized grains, X_{gr}, increases linearly with increasing x. With increase in x, the

magnetostriction of the alloys increases in the amorphous state, but decreases after crystallization. The volume fraction of the nanocrystalline grains occurring in the alloys may increase with increasing x after annealing at a certain temperature.

Four figures, not reproduced, show the crystallization temperature and Curie temperature vs Si content for the alloys. X-ray diffraction patterns of four annealed alloys ($x = 9.5, 11.5, 13.5$, and 17.5), saturation magnetostriction vs Si content in as-quenched and annealed alloys, and initial magnetic permeability vs Si content in annealed alloys, respectively. There are no tables.

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Mossbauer Spectroscopy of Nanocrystalline Fe-Cu-Nb-Si-B Alloys

94P60193C Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 30 No 2, Feb 94 pp B66-B71

[Article by Bai Kuichang [4101 7608 2490], Jiang Ziyang [3068 5261 2019], et al. of the Department of Materials Science and Engineering, Northeastern University, Shenyang: "Structural Study of Nanocrystalline Fe-Cu-Nb-Si-B Alloys by Mossbauer Spectroscopy," supported by grants from NSFC and the CAS Institute of Metals Research's National Key Laboratory for RSA; MS received 7 Jun 93, revised 9 Aug 93]

[Abstract] The Mossbauer spectra of some $\text{Fe}_{73.5}\text{Cu}_1\text{Nb}_5\text{Si}_{13.5}\text{B}_9$ alloy samples as-quenched (amorphous ribbons 25 μm thick and 5-10 mm wide) or after annealing at different temperatures (480, 500, 530, 550, 580, 620°C) have been measured at room temperature. The spectrum of as-quenched sample exhibits a typical broadened sextet as amorphous with mean internal field $H_i = 17.01 \text{ MA/m}$. The structural relaxation or partial crystallization started after annealing at 480 to 500°C for 0.5 h in N_2

atmosphere. General crystallization occurred remarkably well when annealed at 530°C and above. The $\alpha\text{-Fe(Si)}$ nanocrystalline solid solution and residual amorphous are the two main phases after annealing at 530°C for 1 h and the relative amount of the amorphous is about 39.1 percent. The amount of residual amorphous phase decreases with increasing annealing temperature, down to about 25 percent when annealed at 620°C. The internal field of the amorphous also decreases with increasing annealing temperature when general crystallization occurred, however it increases a little at the structural relaxation stage. The nearest neighbor Fe atoms number distribution of Mossbauer atom in $\alpha\text{-Fe(Si)}$ solid solution has been calculated according to their corresponding subspectrum areas. The concentration of Si in the $\alpha\text{-Fe(Si)}$ phase and the ordering degree of the solid solution can also be estimated in the same way. Finally, bulk magnetic texture with different orientation has been found in the sample annealed at 550°C.

Five figures, not reproduced, show a Mossbauer spectrum of an as-quenched alloy and its hyperfine field distribution, Mossbauer spectra of as-quenched and annealed alloys at different temperatures in N_2 atmosphere. Mossbauer spectrum of nanocrystalline alloy after annealing at 530°C for 1 hour and its resolved subspectra, relative amount and mean initial field of residual amorphous phase as a function of annealing temperature, and comparison of Mossbauer spectra of ribbon and powder alloy samples both annealed at 550°C for 0.5 hour after quenching. Two tables, not reproduced, list the composition and heat treatment of samples and the subspectrum parameters of Mossbauer spectrum for sample annealed at 530°C.

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Interfacial Excess Volume in Nanocrystalline Ni-P Alloys

94P60220A Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 30 No 3, Mar 94 pp B121-B125

[Article by Sui Manling [7131 2581 7881] of the CAS International Center for Materials Physics, Northeastern University, Shenyang, and Lu Ke [4151 2688] of the CAS Institute of Metals Research, Shenyang: "Interfacial Excess Volume in Nanocrystalline Ni-P Alloys with Different Grain Sizes," supported by grant from NSFC; MS received 8 Feb 93, revised 15 Aug 93]

[Abstract] Nanocrystalline Ni-P alloys with grain sizes ranging from 13 nm to 107 nm are prepared by the amorphous crystallization method. Experimental conditions are as follows: $\text{Ni}_{80}\text{P}_{20}$ (at.-percent) amorphous alloy ribbons (2.5 mm wide, 30 microns thick) prepared via a melt-chill technique are used for isothermal crystallization; when completely crystallized, the material is rapidly brought down to room temperature. Grain size of these nanocrystals is definitely a function of crystallization temperature and time. Positron annihilation spectroscopy is used to investigate the interfacial defects in these nanocrystalline samples. It is found that with decrease in grain size, the excess volume in a unit volume of interfaces is reduced. Via accurate density measurement and structural characteristic analyses of the nanocrystalline samples, the interfacial excess volume is found to decrease with reduction of grain size, i.e., a densification of interfaces. This result is in good agreement with those from positron annihilation experiments and from measurements of other properties.

Four figures, not reproduced, show the following graphs: positron-lifetime spectrum of nanocrystalline Ni-P alloy (sample A), short- and intermediate-lifetime components of nanocrystalline Ni-P alloy samples vs grain size of Ni_3P , time constant and intensity of long-lived component of measured lifetime spectra of nanocrystalline Ni-P alloy sample vs grain size, and interfacial excess volume of nanocrystalline Ni-P alloy vs Ni_3P grain size, respectively. The one table, not reproduced, lists the heat-treatment scheme (annealing temperature and time) and mean Ni_3P grain size of nanocrystalline Ni-P alloy samples.

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Domestically Made Nanodevices Inserted into Human Cell

94P60219A Shanghai WEN HUI BAO in Chinese 6 Apr 94 p 3

[Article by Wang Yuhua [3769 3768 5478] and Chen Zhihong [7115 1807 7703]: "Ultramicroelectrode, Sensor Developed"]

[Summary] Wuhan (WEN HUI BAO special dispatch)—Wuhan University Ph.D. candidate Zhang Xueji [1728 1331 6068], in a 3-year NSFC-funded research project, has made an astounding breakthrough: he has developed a nanoscale (diameter 1/1000th of a human hair) electrode and sensor, which were just certified by the Education Commission. Moreover, Zhang has succeeded in inserting these nanodevices into a single human cell (diameter of 10 microns) and detecting the intracellular content of the neurotransmitter dopamine. These nanodevices were fabricated via a new electro-polymerization and insulation technique and plasma bombardment lithography. This is the first report worldwide of the development of such small nanodevices and their insertion into a single human cell.

China Claims World's First Two Space-Communications-Qualified HTS Antennas

94P60197A Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 8 Mar 94 p 1

[Article by Fan Jian [5400 1696]: "Space Communications Gets Superconducting Antennas"]

[Summary] China has developed the world's first circularly polarized high-temperature superconducting (HTS) microstrip antenna and HTS side-feed H antenna suited to the requirements of space communications, and has thus "superconductorized" a complete antenna system. This major achievement was jointly realized by Qinghua University's Department of Modern Applied Physics and Department of Electronic Engineering in collaboration with North China Industrial University and the Beijing General Institute of Nonferrous Metals.

The HTS microstrip antenna consists of an yttrium-based thin film on a superconducting lanthanum-aluminate substrate. The antenna's power divider and feed circuit are both fabricated from superconductors. Operating frequency is 6.17×10^9 Hz; at a 77K temperature and 20 mW input power, antenna efficiency is 3.3 times [i.e. 330 percent] higher than that of the identical silver-film circularly polarized antenna.

The HTS side-feed H antenna has a radiator and feed circuit also fabricated from an yttrium-based thin film on a lanthanum-aluminate substrate. This small, high-efficiency antenna, easy to integrate and to form into arrays, has an operating frequency of 2.25×10^9 Hz; at 77K and 20 mW input power, antenna efficiency is 3.4 times [i.e. 340 percent] higher than that of the identical silver-film H antenna. Moreover, its efficiency is also higher than that of bottom-feed superconducting H antennas developed abroad.

Biotechnology

Cloning and Expression of Coat Protein Gene of Soybean Mosaic Virus in *Escherichia coli*

40091009A Beijing SHENGWU GONGCHENG XUEBAO [CHINESE JOURNAL OF BIOTECHNOLOGY] in Chinese Vol 9 No 3, Aug 93 pp 198-203

[English abstract of article by Liu Junjun [0491 0193 0689], Peng Xuexian [1756 1331 6343], et al. of the Dept. of Plant Biotechnology, Institute of Microbiology, Academia Sinica, Beijing]

[Text] The 3'-terminal genomic region of the Beijing isolate of Soybean Mosaic Virus (SMV-BJ) has been cloned through technique of polymerase chain reaction (PCR). The nucleotide sequence of 3' region of SMV-BJ genome was analyzed. Comparisons of the nucleotide and deduced amino acid sequences of SMV-BJ coat protein gene with those of SMV-N strain show 93.4 percent and 98.5 percent identity between them, respectively. Alignments of the 3' non-coding sequence in pair with that of SMV-N strain show homology of 88.8 percent. It has been found that the SMV coat protein gene is expressed in *E. coli* by western blot analysis. The coat protein produced in *E. coli* has the same electrophoretic mobility as SMV coat protein.

High Level Expression of Human Prourokinase cDNA in Chinese Hamster Ovary (CHO) Cells

40091009B Beijing SHENGWU GONGCHENG XUEBAO [CHINESE JOURNAL OF BIOTECHNOLOGY] in Chinese Vol 9 No 3, Aug 93 pp 204-209

[English abstract of article by Cheng Dusheng [4453 1653 0524], Yu Weiyuan [0205 3555 3293], Han Suwen [7281 4790 2429], et al. of the Institute of Biotechnology, Academy of Military Medical Sciences, Beijing]

[Text] The Chinese Hamster Ovary (CHO) cells have been used to express high levels of human prourokinase gene cDNA with recourse to construction of good expression vector, the improvement of transfection technique and gene coamplification. First, the expression plasmid pMG10102 was constructed by placing Pro-UK cDNA under the control of SR α promoter/SV 40 polyadenylation signals and expressed transiently in COS-7 cells. Expression level was about 5 folds higher comparison with SV 40 early promoter. Linear plasmids pMG10102 and pSV 2-dhfr were then cotransfected into CHO-dhfr^r cells by calcium phosphate coprecipitation and cells were cultured in selective medium. Twenty transformants expressing Pro-UK were picked, the range of expression levels was 12.5-100 IU/10⁶ cells/day. When subjected to stepwise selection of methotrexate (MTX), stable cell lines that secreted up to 400-500 IU/10⁶ cells/day were obtained. Western Blot analysis showed that molecular weight of secreted recombinant Pro-UK was the same as that of natural Pro-UK which is 52 kDa and more than 60 percent of expression production was single chain urokinase (rscUK) without protease inhibitor in medium.

Determination and Analysis of Nucleotide Sequence of Plasmid pXZ10145

40091009C Beijing SHENGWU GONGCHENG XUEBAO [CHINESE JOURNAL OF BIOTECHNOLOGY] in Chinese Vol 9 No 3, Aug 93 pp 216-222

[English abstract of article by Shen Tianxiang [3088 1131 5046], Jia Panxing [6328 4149 5281], et al. of the Institute of Microbiology, Academia Sinica, Beijing]

[Text] With U.S.-made ABI 370A autosequencer, the total nucleotide sequence of plasmid pXZ10145 from *Corynebacterium glutamicum* 1014-6T has been determined using the dideoxy chain termination method. The plasmid contains 4887 base pairs (bps). Computer aided analysis of the sequence showed the location and number of restriction enzyme cutting sites and revealed eight open reading frames (ORFs) on the plasmid. The two sites on the plasmid pXZ10145, at which deletion occurred to result in plasmid pNAT65 were confirmed. At these two sites a seven base pairs sequence "ATCTAGC" was found.

Electroporation of Foreign DNA Into *Escherichia coli* Using Chinese-Made Gene Pulser

40091009D Beijing SHENGWU GONGCHENG XUEBAO [CHINESE JOURNAL OF BIOTECHNOLOGY] in Chinese Vol 9 No 3, Aug 93 pp 237-240

[English abstract of article by Song Shiduo [1345 6108 6995], Zhang Tonghai [1728 0681 3189], et al. of the Department of Internal Medicine, The Second Teaching Hospital, Tianjin Medical College, Tianjin, and Xu Baoqiang [1776 1405 1730] and Liu Jianmin [0491 1696 3046] of the Department of Electronic Engineering, Tianjin Institute of Technology, Tianjin]

[Text] In this study, successful transformation of plasmid DNA and transfection of phage DNA into *E. coli* were described by using intense electrical field of exponential decay waveform generated by a Gene Pulser LN-101. The 10⁹-10¹⁰ transformants/ μ g DNA with strain DH 5 α , and plasmid pUC 18 were obtained by a single voltage pulse at 1.0-2.5 kV with 5-20 μ F capacitor. The efficiency of electroporation depends on various parameters: the electric field strength, capacitance, the pulse length etc. The frequency of transformation was a linear function of the DNA concentration, same as the density of recipient cell. The effect of time of pre-and post-shock incubation of cell with DNA was insignificant. The high efficiency of transfection also was achieved with strain JM 109 and M 13 mp 19 RF by electroporation.

Electrofusion of Protoplasts From *Aspergillus niger*

40091009E Beijing SHENGWU GONGCHENG XUEBAO [CHINESE JOURNAL OF BIOTECHNOLOGY] in Chinese Vol 9 No 3, Aug 93 pp 241-246

[English abstract of article by Zhou Zhenghong [0719 2973 4767] and Fang Shankang [2455 0610 1660] of the Department of Microbiology, Shandong University, Jinan]

[Text] Wild-type strains of *Aspergillus niger* N-11 and N-16 (Raw-starch-digesting glucoamylase producers) were mutagenized by UV and NTG respectively. *A. niger* auxotrophs No. 2 (lys⁻) and No. 3 and No. 5 (Arg⁻) were obtained and used as parent strains.

The auxotrophs were treated by a combined enzyme system containing cellulases and snailases. The effect of factors, including the concentration of enzymes, age of mycelium on the formation and regeneration of protoplasts in these auxotrophs were studied.

This work systematically investigated the condition of electrofusion on the protoplasts of the mutants using U.S. BAEKON-2000 Advanced Gene Transfer System, an optimal yield of hybrids able to form colonies on MM/CM was found at A [Amplitude] = 4.5 kV/cm, Np [Number of Pulse] = 32, Tp [Pulse Width] = 62.5 μ s, Tb [Burst Time] = 0.2 s, Cy [Cycle] = 10, D [Distance] = 3mm and Ff (fusion frequency) = 60 percent of the fusants selected statistically were stable and most of them show the increase in the active unit of enzyme.

High Level Expression of ipaBC Gene From *Shigella flexneri* 5M90T and Investigation of Their Immunoprotective Response in Mice

40091009F Beijing SHENGWU GONGCHENG XUEBAO [CHINESE JOURNAL OF BIOTECHNOLOGY] in Chinese Vol 9 No 3, Aug 93 pp 247-251

[English abstract of article by Rui Xianliang [5360 6343 5328], Xu Yongqiang [1776 3057 1730], et al. of the Institute of Biotechnology, Academy of Military Medical Sciences, Beijing]

[Text] In this report, the 3.3 kb ipaBC structure gene fragment from a subcloned plasmid pMG488 were recovered and inserted into the EcoRI and SmaI cloning sites of high level expression vector pBV220, which made the expression of ipaBC gene under the control of P_{RPL} tandem promoter. Two kinds of recombinant plasmids were constructed (pMG501 and pMG601). They effectively expressed high levels of peptide b and c, both in *E. coli* DH5 α and in avirulent *S. flexneri* 5M90TA. Preliminary experiment in mice showed that peptide b and c had some immune protection against the challenge with virulent *S. flexneri* 5M90T.

High Level Expression of HBV X Gene in *Escherichia coli* and Detection of Anti-HBx Antibodies in Sera of Patients With Liver Diseases

40091009G Beijing SHENGWU GONGCHENG XUEBAO [CHINESE JOURNAL OF BIOTECHNOLOGY] in Chinese Vol 9 No 3, Aug 93 pp 252-255

[English abstract of article by Tong Yigang [4547 6318 0474], Huang Yaoxuan [7806 5069 3551], and Wu Guanghui [6762 0342 5610] of the Institute of Hepatology, General Hospital of Beijing Army, Beijing]

[Text] HBV genome contains four open reading frames, that is ORF S, C, P and X. In this study, HBV X gene was cloned and expressed in *E. coli* using different vectors constructed with lpp and M13 gene II promoters. The X protein synthesized by *E. coli* was identified immunologically by ELISA and Western blot with anti-X antibodies elicited by synthetic X peptides and X fusion protein respectively. The recombinant X protein was then used to look for anti-X antibodies by ELISA in the sera of patients with liver diseases. A total of 212 seral samples were assayed. The positive rate in the patients with liver cirrhosis, chronic active hepatitis, hepatocellular carcinoma, chronic persistent hepatitis and acute

hepatitis B were 49.3 percent, 47.6 percent, 37.8 percent, 29.6 percent and 40.0 percent respectively. Most of the anti-X antibodies with high titer were found in the sera of patients with liver cirrhosis and chronic active hepatitis.

Production of Interferon α A by *Escherichia coli* W 3110 (pEC 901)

40091009H Beijing SHENGWU GONGCHENG XUEBAO [CHINESE JOURNAL OF BIOTECHNOLOGY] in Chinese Vol 9 No 4, Nov 93 pp 332-336

[English abstract of article by Kang Fengxian [1660 7685 0341], Ye Qin [0673 0530], et al. of the Research Institute of Biochemical Engineering, East China University of Science and Technology, Shanghai]

[Text] The maximum specific growth rates, saturation constants, maintenance coefficients and growth yields for *E. coli* W 3110 (pEC 901) and the host, W 3110, were estimated through continuous cultivation of the two strains. The growth rate of the transformant was lower than that of the host while its maintenance metabolism increased due to the existence of plasmid pEC 901. Both the plasmid stability and the expression level of interferon increased with the increase in dilution rate. In fed-batch culture, the growth rate of W 3110 (pEC 901) maintained at a high level by controlling the feeding rate of glucose, and the interferon titer reached 2.5×10^{10} u/L, which was greatly improved compared with those reached in shake flask cultures.

Liquid Exchange and Oxygen Transfer Models in CellCul-20A Bioreactor

40091009I Beijing SHENGWU GONGCHENG XUEBAO [CHINESE JOURNAL OF BIOTECHNOLOGY] in Chinese Vol 9 No 4, Nov 93 pp 372-378

[English abstract of article by Wang Sijing [3769 2448 7231], Chen Yinliang [7115 0936 5328], and Yu Juntang [0205 0193 2768] of the Research Institute of Biochemical Engineering, East China University of Chemical Technology, Shanghai]

[Text] To further improve the CellCul-20 bioreactor, the cage aeration oxygen-supply device was installed. In this paper, based on the mass transfer characteristics of the stirred bioreactor with a cage aeration device, a novel experimental method and the correlations of liquid exchange rates have been presented for measuring the liquid exchange rates through the metal screen. On these bases, a mathematical model of oxygen transfer on deep aeration has been established. The theoretical analyses and the experimental results show that the total oxygen transfer capacity can be enhanced by increasing the cage volume and oxygen transfer efficiency inside the cage. [Also see Chinese-made bioreactor on JPRS-CST-93-019 p 8 and p 10.]

Study on Rotary-Tray Fermenter for Solid State Culture Applying the Single Cell Protein Production

40091009J Beijing SHENGWU GONGCHENG XUEBAO [CHINESE JOURNAL OF BIOTECHNOLOGY] in Chinese Vol 9 No 4, Nov 93 pp 383-386

[English abstract of article by Ma Guirong [7456 2710 2837], Zhang Yuzhen [1728 3768 5271], and Kong Jian [1313 0256] of the Institute of Microbiology, Shandong University, Jinan]

[Text] A rotary-tray fermenter for solid state fermentation (SSF) has been studied to produce the single cell protein (SCP). The equipment has mechanical input, agitation, output device and feeder. The temperature and relative humidity were regulated by an automatic control system. It has a maximum working capacity of one ton and can be scaled up to the production plant level. This equipment for SSF has been used for SCP production on raw starchy material with SC₈₅ and ST₈₅₁. During the processes the protein content increases from 15.7 to 40.7 percent for 24 hours. The product quality was stable.

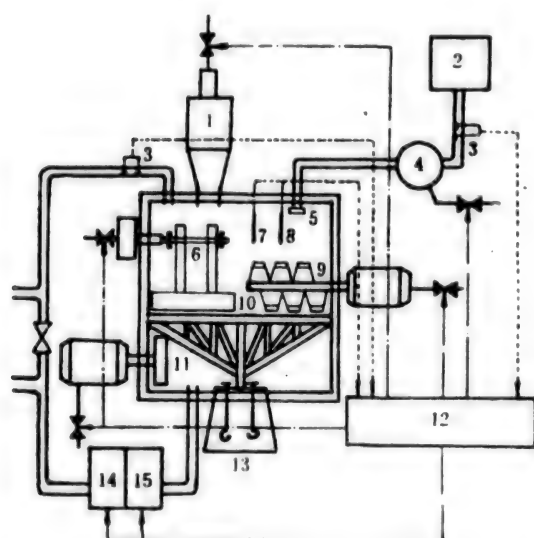


Figure 1. Schematic Diagram of Fermenter and Experimental Flow Sheet

1. Feeder; 2. Feeding tank; 3. Flowmeter; 4. Pump; 5. Sprayer; 6. Spread-scraper; 7. Temperature probe; 8. Moisture probe; 9. Agitator; 10. Fermenter; 11. Drive shaft; 12. Control device; 13. Pedestal; 14. Air filter; 15. Heater

Antibody-Mediated Early Death in Mice Infected With the Virus of Hemorrhagic Fever With Renal Syndrome

40091009K Beijing ZHONGHUA WEISHENGWUXUE HE MIANYIXUE ZAZHI [CHINESE JOURNAL OF MICROBIOLOGY AND IMMUNOLOGY] in Chinese Vol 14 No 1, Feb 94 pp 16-18

[English abstract of article by Yao Chuzheng [1202 2806 6927], Huang Lili [7806 5461 5461], et al. of the Institute of Epidemiology and Microbiology, Chinese Academy of Preventive Medicine, Beijing]

[Text] The present report describes an experiment in which outbred adult Kunming strain mice were iv inoculated with HFRS virus-immune rabbit or murine serum. Control mice received nonimmune rabbit or murine serum. With different intervals of 0.5, 24 and 48 hours, both groups of animals were i.c. infected with 10^5 LD₅₀ (0.03 ml) of HFRS

virus A-16 strain and injected with 50 mg/kg cyclophosphamide dose/for four doses at days -1, +1, +2 and +4 (day 0: viral infection). Results showed that the incubation period was shorter than usual, and early death phenomenon was observed in mice given small amount of immune serum, compared with control mice. In addition, in experimental animals, enlargement of spleens was noted and perivascular infiltration of inflammatory cells in brain was more severe than those of control mice. The implications of these findings for the pathogenetic mechanism of HFRS are discussed.

Key words: Hemorrhagic fever with renal syndrome; Viral infection; Early death; Immunopathological response

The Pathogenesis of *Shigella* species: Roles of Invasive Outer Membrane Proteins and O Antigen in the Entry Process

40091009L Beijing ZHONGHUA WEISHENGWUXUE HE MIANYIXUE ZAZHI [CHINESE JOURNAL OF MICROBIOLOGY AND IMMUNOLOGY] in Chinese Vol 14 No 1, Feb 94 pp 19-21

[English abstract of article by Zhang Rongping [4545 1369 5493] and Chen Enlin [7115 1869 5259] of the Department of Microbiology, Tianjin Medical College]

[Text] The virulence and the virulence-associated phenotypes of *Shigella* species were investigated with Ipa⁺Oag⁺, Ipa⁺Oag⁻, and Ipa⁻Oag⁺ strains, respectively. Results showed that strains S₁R101/pHS4108 (Ipa⁺Oag⁺) and BS169/pHS4108 (Ipa⁺Oag⁺) were capable of entering HeLa cells; while *S. sonnei* strain S₁R102/pJM56 which could only express a, c, and d and *S. flexneri* strain T32 (Ipa⁺Oag⁺) were incapable of entering HeLa cells. It is suggested that invasive plasmid polypeptides alone may be sufficient for the entry of the bacillus into the cells, and O antigen may not be involved or play little role, if any, in this process.

Key words: *Shigella* species; Invasion outer membrane protein; O antigen; Virulence phenotype

Effect of L-Isoleucine and Glycine on Catechol 2,3-Dioxygenase Expression and Excretion in *Escherichia coli*

40091009M Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese Vol 34 No 1, Feb 94 pp 37-44

[English abstract of article by Xia Dongxiang [1115 2639 5046] and Wang Meixian of the Dept. of Microbiology, The Fourth Military Medical University, Xi'an]

[Text] The secretion of gene products expressed in *E. coli* is a problem noticeable nowadays. Effect of glycine and L-Isoleucine on catechol 2,3-dioxygenase (CatO₂ase) expression and secretion was reported here. Both L-Ile and Gly could increase CatO₂ase production, Gly could also cause expressed product excreted into the culture medium. The effect of Gly and L-Ile was related to the composition of culture medium, the concentration of Gly and L-Ile and the culture time. The sensitivity to lysozyme of bacterium cells grown in the Gly containing medium was a little higher and electron micrograph of bacteria grown in Gly-containing medium showed morphological changes of cell wall and outer membrane. This may have been due to interference

with peptidoglycan synthesis by the Gly, and cause passability increase, as reported in other bacterium strains.

Cloning and Expression of Yeast PHO81 Gene

40091009N Shanghai SHENGWUHUAXUE YU SHENGWUWULI XUEBAO [ACTA BIOCHEMICA ET BIOPHYSICA SINICA] in Chinese Vol 26 No 1, Jan 94 pp 59-65

[English abstract of article by Chen Jinlian [7115 6855 5571], Wu Jiansheng [0702 0256 3932], et al. of the National Laboratory of Molecular Biology, Shanghai Institute of Biochemistry, Academia Sinica]

[Text] Through in situ hybridization, a 3.0 kb BamHI fragment and a 5.0 kb PstI fragment were obtained from the yeast gene library. The BamHI fragment contains 1745 bp N-terminal coding sequence and 1244 bp upstream sequence of PHO81 gene, the PstI fragment contains 2236 bp C-terminal coding region and 2.8 kb downstream sequence and their overlapping region is about 450 bp. We constructed the complete PHO81 gene by ligating these two fragments. The part of coding region of PHO81 gene was replaced with URA 3 gene and used as donor to transform YPH499 to URA 3. A PHO81 mutant resulted from disruption of the chromosomal counterpart. The coding region of PHO81 gene was fused in frame with Lac Z and assayed by β -galactosidase activity. The results show that the PHO81 gene is under the same transcriptional control as PHO5 and PHO11 genes. The PHO81 gene is transcribed at high level in media containing low amounts of inorganic phosphate (Pi). Transcription of the PHO81 gene is repressed when cells are supplied with large amounts of Pi in the media. Sequence comparisons revealed that the upstream sequence of PHO81 gene shared little homology with PHO5 or PHO11 genes.

Key words: Yeast; PHO81 gene; Gene Expression

Change of Pulmonary Beta-Adrenergic Receptor and Its Relation to Metabolism of Membranous Phospholipids During Endotoxin-Induced Rat Lung Injury

40091009O Beijing ZHONGGUO YINGYONG SHENGLIXUE ZAZHI [CHINESE JOURNAL OF APPLIED PHYSIOLOGY] in Chinese Vol 10 No 1, Feb 94 pp 67-69

[English abstract of article by Sun Gengyun [1327 5087 5089] and Mao Baoling [3029 1405 7881] of the 2nd Affiliated Hospital, Third Military Medical College, Chongqing and Lu Baozhang [0712 1405 3864] of the Academy of Military Medical Sciences]

[Text] Change of beta-adrenergic receptor (β -AR) in lung tissue during endotoxin-induced rat acute lung injury was observed with radioligand binding assay. The lipid fluidity and phospholipids content of the cellular membrane of lung tissue were measured with fluorescence polarization and high performance liquid chromatography respectively. The results showed that:

- (1) 4 hours after the endotoxin injection, there was a significant decrease in the maximal binding capacity of β -AR by 47 percent as compared with the control group;

- (2) endotoxin could markedly decrease the lipid fluidity and phospholipids content of lung cell membrane, meanwhile there was elevated activity of phospholipase A₂ (PLA₂) in the tissue of rat lungs.

The data suggest that:

- (1) the down regulation of β -AR, that can diminish the function mediated by β -AR, plays a role in the pathogenesis of endotoxin-induced acute rat lung injury;
- (2) the activation of PLA₂ can be an important factor reducing the phospholipids content of cell membrane and thus leading to the decrease of membranous lipid fluidity, resulting in reduction of the lateral diffusion and rotatory movement of β -AR and decrease in chance of β -AR to bind with the ligands. As a result of these changes, down regulation of β -AR appears.

Key words: acute lung injury; endotoxin; beta-adrenergic receptor; membranous phospholipid

Computers

Latest Reports on Domestic Databases

Nationwide Electronics Industry DB

94P60204A Beijing ZHONGGUO DIANZI BAO [CHINA ELECTRONICS NEWS] in Chinese 11 Mar 94 p 3

[Article by Wang Hao [3769 1170]: "National Electronics Database Taking Shape"]

[Summary] It was learned on 4 March that a national database for electronics industry firms and products, now taking shape, has gathered data on 10,000 electronics firms and over 20,000 varieties of electronic products. Growing out of an elementary electronics industry DB begun by MEI's First Research Institute 5 years ago, this third (94-95) [Chinese] edition of the "Electronics Entrepreneurial and Business Firms Directory" and an English version titled "Directory of Chinese Electronics Firms" are about to hit the market. A corresponding computer DB search system is also about to be unveiled. It is understood that the main DB information is to be tripled or quadrupled yearly.

Shanghai S&T Tracking DB

94P60204B Shanghai WEN HUI BAO in Chinese 17 Mar 94 p 3

[Article by Chu Nailiang [5969 0035 5328]: "Science and Technology Tracking Database Established"]

[Summary] The Shanghai S&T Information Institute in cooperation with systems engineers and government technical authorities from throughout the municipality has set up the "Shanghai Municipal Key Project Area and Industry S&T Tracking Database." This DB, founded upon a 3-year effort, tracks S&T developments and trends in 20 fields and industries—including high-tech areas, agrotechnology, industrial pollution control and improvement of the municipal environment—not only in Shanghai but in all of China and worldwide. In addition to new developments, the DB includes information on such subjects as new products, key technologies and processes, industrial production, imports of high-tech equipment, and foreign exchange earned for exported products.

China S&T Information DB

94P60204C Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 3 Apr 94 p 2

[Unattributed article: "'China S&T Information Database' Unveiled"]

[Summary] The Dannong [0030 0309] Science and Technology Intermediate Testing Company and Beijing Xinli-kang [0207 0500 1660] New Technologies Development Company have jointly completed a "China S&T Information Database." This DB, covering the period from 1985 to the present, has gathered information on over 100,000 outstanding domestic S&T achievements, patented technologies, and utilitarian technologies. Information includes inventor's name, point of contact, address, telephone number, an introduction to the technology, technical specifications, and economic information. Fields covered include machinery, electronics, chemical engineering, agriculture, metallurgy, petroleum, heavy industry, transportation, energy resources, environmental protection, light industry, and construction.

DB a Boon to Information-Hungry Businesses

40100052A Beijing CHINA DAILY (BUSINESS WEEKLY) in English 4 Apr 94 p 7

[Article by Xiao Gao: "Database a Boon to Information-Hungry Businesses"]

[Text] When an enterprise prepares to enter a market, it's always eager to learn about the suppliers, the potential consumers and the conditions of its counterparts. It was in response to the need for such information that the Chinese Enterprises and Companies Database (CECDB) was formed.

The CECDB was developed in 1989 by Beijing-based Wanfang Data Centre, which is affiliated with the Institute of Scientific and Technical Information of China (ISTIC). Now it's being managed by Wanfang Data Co, which ISTIC established last year on the basis of Wanfang Data Centre.

CECDB is the only industrial and business database in China that has both Chinese and English editions.

Wanfang Data Co is expected to present '94 CECDB, the newest version, early this month. Its Chinese edition involves more than 60 categories of information about China's 100,000 major enterprises, such as their executives, address, turnover, capital, profits, products and output, exports and trademarks.

The English version is a painstaking selection of 40,000 of the enterprises.

The '94 CECDB will be available to Chinese and foreign users of electronic information services through floppy disks, CD-ROMs and other computer devices.

In the past five years, tens of thousands of items of information have been channelled through Wanfang Data or the CECDB.

More than 1000 people scattered in mainland cities, Hong Kong, Southeast Asia, North America and Europe use CECDB floppy disks and CD-ROMs. They have access to the information in CECDB at any time.

To keep its information fresh, Wanfang Data Co will produce two editions of CECDB beginning this year.

Wanfang Data acts as the bridge between sellers and buyers, producers and suppliers, foreign enterprises and Chinese partners. Many businesses have benefited from the database. For example, a Wuxi printing firm specializing in wine labels learned about hundreds of wineries through CECDB. It marketed its services and received many orders, creating considerable profits.

The Tianjin-based Tianci Co also benefited from CECDB. In 1992, a new type of mineral water pot it produced sold poorly because of low-quality temperature controls. Through CECDB, Tianci discovered a more reliable supplier in Guangdong Foshan Temperature Control Firm.

Latest Reports on U.S. Software Firms in China

DEC Markets First Software Frames

94P60205A Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 15 Mar 94 p 4

[Article by Li Qingbo [2621 3237 3134]: "U.S. Firm DEC Markets First Batch of Software Frames to Users in China"]

[Summary] Following upon its first installation of Alpha AXP computers in China [see JPRS-CST-94-004, 1 Apr 94 p 17], DEC on 11 March in Beijing announced to Chinese users the first group of computer software frames in today's computer world. This group of several hundred products, first announced in the U.S. on 8 February, consists of software programs that serve as intermediaries between computer operating systems—particularly OSF/1—and applications software programs, especially among today's widely popular client-server networks.

CASC, CV Establish Joint Venture

94P60205B Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 2 Apr 94 p 4

[Article by Xiao Bo [2556 2330]: "China, U.S. Joint Venture to Develop High-Tech Engineering Software"]

[Summary] The China Aerospace Industry Corporation (CASC) and the U.S. firm CV on 29 March in Beijing signed an agreement to establish the joint venture Four-Dimensional Information Technology Ltd. This new joint venture will produce CAD/CAM software. CV, one of the world's leading manufacturers of software for engineering applications, and CASC will merge their strengths in technology, management, and marketing to provide [world] market customers with high-quality products and services. It is understood that CASC is CV's first customer in China.

Microsoft Puts Heat on Software Makers

40100054A Beijing CHINA DAILY (BUSINESS WEEKLY) in English 4 Apr 94 p 1

[Article by Xiao Pei: "Microsoft Puts Heat on Software Makers"]

[Text] The hope of China's computer industry lies in the software sector, for domestic hardware manufacturers are only vendors of foreign products.

And the hope of China's software sector is in the Chinese word, which is unique in the world.

However, this last fortress is now in danger. When Bill Gates, chairman and chief executive of Microsoft Corp, the world's biggest software maker, came to China last month, he brought with him Microsoft's Chinese-language versions of its software products.

Now China's fledgling software companies are feeling the presence of the most intimidating competitor they have yet encountered.

To market the Chinese version of its office applications products, Microsoft has trained more than 140 domestic vendors.

Its engineers and salesmen will travel the country giving more than 100 lectures on its products, said Patrick Tien, marketing manager of Microsoft's Beijing representative office.

He revealed that Microsoft will soon set up a wholly-owned venture in China to intensify its presence.

Tien is optimistic about sales of Microsoft's products in China, and many others have little doubt.

"If Microsoft is allowed to enter China, it may monopolize the whole market," warned Yang Tianxing, director of the Computer Department under the Ministry of Electronics Industry.

Yang said that more than 90 percent of personal computers in China use Microsoft's operating systems, which form a solid foundation for Microsoft's localized products.

"Microsoft can sell its English version of products in China and the localization work should be done by Chinese," Yang said. "Microsoft should not do everything by itself."

China hopes to cooperate with Microsoft and gain its support in setting up a standard for Chinese versions of softwares, Yang said.

But Microsoft did not want a unified Chinese standard and developed its own version to seize control of China's potentially massivemarket.

Yang said the government and some companies are trying to work out the standard. If not compatible with the standard, Microsoft's products will be banned from China, he said.

But many experts doubt whether the ban can really protect Chinese software companies. Although the Chinese version of Windows, one of Microsoft's most popular operating systems, is not allowed to be sold in China, it is grabbing market share through unauthorized channels.

Within half a year, the market share of "Chinese Star for Windows," a rival product developed by Sun Tendency Co, a Chinese company based in Beijing, has dropped from 90 percent to 60 percent, said Pan Jianxin, Sun Tendency's marketing manager.

But Pan said he has confidence Sun Tendency can compete with Microsoft. "Microsoft is very powerful, but it is not invincible," he said. "Software is a kind of culture," Pan said. "To monopolize the software market means changing Chinese culture. Could Chinese people accept this?"

Maybe that is why Microsoft tolerates the existence of Chinese Star. To kill it would be quite easy for Microsoft, Pan admitted.

"This year will be crucial for China's computer industry," he said. "If we lose this battle, all will be lost."

Tien said Microsoft will try to "do things right" by satisfying all sides—Bill Gates, Chinese customers and software developers.

Wordperfect Corp Makes Market Bid

40100056A Beijing CHINA DAILY in English
23 Apr 94 p 2

[Article by Lao Chen: "Software Giant Makes Market Bid"]

[Text] A Chinese version of WordPerfect, a popular word processing software package in the West, is being introduced into China. The new software, known as WordPerfect 5.2CS for DOS, was demonstrated on Thursday in Beijing by the WordPerfect Corporation of the United States.

Mark Fowle, Sales Manager for the Singapore-based WordPerfect Asia, said his company is aware that Sinicized DOS is the most popular platform for PCs in China.

WP5.2CS incorporates most of the latest improvements in the WP series of word processors. It produces simplified Chinese characters, although it can also display and print older complex Han characters.

While the version demonstrated on Thursday is ready for distribution, its Beijing-based agent, Tiandi Information Systems Limited, will probably wait a couple of months before releasing it for sale.

WordPerfect has also developed a version 6.0 for DOS which is a vast improvement over earlier versions which were dependent on function keys.

The version 6.0 for Windows, which is similar to the DOS version, was rated by PC/Computing magazine as the Most Valuable Product of 1993.

Two U.S. Firms Sign Deals with East China Computer Institute

40100055A Beijing CHINA DAILY (BUSINESS WEEKLY) in English 18 Apr 94 p 4

[Unattributed news brief: "Computer Links"]

[Text] Co-operation with foreign computer giants has promoted the development of the East China Computer Research Institute. Last year, the institute's output topped 300 million yuan (\$34.5 million). As a major computer research base in the region, the institute has made brilliant contributions to China's research in high-speed computers and rocket-carried computers. The research institute's high technological standards have attracted many major foreign companies. Hewlett Packard Co, a leading personal computer maker in the United States, has teamed up with the institute to create the Shanghai Huapu Computer Corp. Another American company, Tandem Corp, has joined with the institute to set up the Shanghai Huateng Computer Corp.

Factory Automation and Robotics

Latest Reports on Sophisticated Robots

Remote-Controlled Robot for Nuclear Environments

94P60207A Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 22 Mar 94 p 1

[Article by Li Beidou [2621 0554 2435]: "Major Advance in Research on Robotics for Nuclear Environments"]

[Summary] A five-eye, two-mechanical-hand remote-controlled mobile industrial robot prototype capable of operating in nuclear-industry environments passed acceptance check on 18 March at the Shenyang Robotics Technology State Engineering Research Center. This sophisticated robot was developed under the State 863 Program's Intelligent Robotics area in a 7-year effort by five research units led by the CAS Shenyang Institute of Automation. The robot is equipped with five cameras (its "eyes") to guide it to its assigned target and to avoid obstacles; the robot also has two flexible mechanical hands which can accurately place a lump of sugar into a water cup and can disassemble a flange plate, reassemble it, and retighten the screws. This major development indicates China's research on nuclear-capable robots has advanced into the world's front ranks.

Nation's First Neural-Net-Controlled Robot

94P60207B Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 26 Mar 94 p 2

[Article by Li Wei [2621 1792]: "Nation's First Neural-Network Controlled Robot Unveiled"]

[Summary] The nation's first neural-net-controlled robot hand-eye system, developed by the University of Science and Technology for National Defense (USTND), passed expert technical appraisal a few days ago in Changsha. Perfected by a USTND research group led by Prof. Wang Zhengzhi [3769 2973 1807], this robot—via a learning process—successfully implements coordinated control in three-dimensional space. With its vision-guided system, the robot can grasp any number of objects in an assigned work space and then position them in proper order on a tabletop. This is the first domestically developed robot incorporating self-organizing neural nets into a hand-eye coordinated-control system—a world-class achievement.

Lasers, Sensors, Optics

Development of Picosecond Photoconductive Switches, Application to Ultra-Wideband Radar

94P60191A Chengdu DIANZI KEJI DAXUE XUEBAO [JOURNAL OF UNIVERSITY OF ELECTRONIC SCIENCE AND TECHNOLOGY OF CHINA (UESTC)] in Chinese Vol 22 No 6, Dec 93 pp 650-654

[Article by Yuan Naichang [5913 0035 2490], Ruan Chengli [7086 2052 4409], and Lin Weigan [2651 3634 1626] of the Institute of Applied Physics, UESTC, Chengdu 610054: "Development, Application Study of Picosecond Photoconductive Switches," supported by grant from National Defense Research Fund; MS received 24 May 93, revised 3 Sep 93]

[Abstract] Picosecond (ps) GaAs:Cr and InP:Fe photoconductive switches are analyzed and fabricated by an LEC (liquid-encapsulated Czochralski) method. The switches have a room-temperature resistivity of $10^8 \Omega\text{-cm}$ and a carrier lifetime of about 100 ps. The switches are used to detect laser waveforms, to develop a laboratory model of an ultra-wideband (UWB) radar, and to develop a V-conical UWB antenna for transmitting the UWB pulses.

Figures 1-3, not reproduced, show schematics of GaAs:Cr and InP:Fe photoconductive switches, a graph of the output electric pulse waveform when the InP:Fe photoconductive switch carries optical pulse radiation, and a plot of the envelope of the YAG mode-locked laser light detected by a ps pulsed laser, respectively. Figures 4 and 5 are reproduced below.

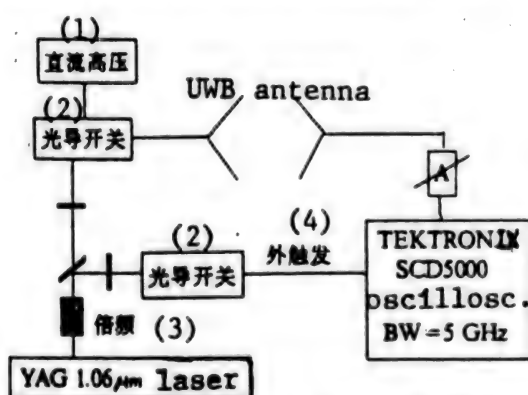


Figure 4. Laboratory Operating Model of UWB Radar

Key: 1. dc voltage; 2. photoconductive switch; 3. frequency doubler; 4. external trigger

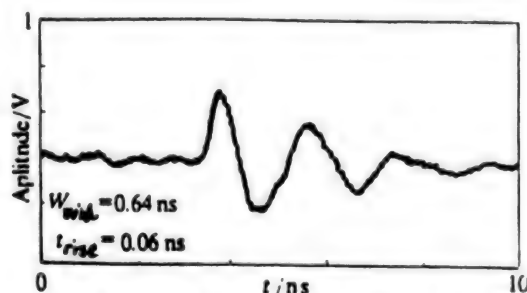


Figure 5. Radiated and Received Results for UWB Radar Lab Model; Distance Between Two Antennas Is 5 m.

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Room-Temperature CW 1.48-Micron Single-Quantum-Well Laser Fabricated by LPE

94P60191B Shanghai ZHONGGUO JIGUANG [CHINESE JOURNAL OF LASERS] in Chinese Vol A21 No 1, Jan 94 pp 1-4

[Article by Yang Zhijian [2799 1807 1017], Dang Xiaozhong [8093 1420 1813], et al. of the Department of Physics, Beijing University, Beijing 100871, and Chen Gaoting [7115 7559 1656] of the CAS Shanghai Institute of Optics and Fine Mechanics, Shanghai 201800: "Room-Temperature Continuous-Wave 1.48- μ m Single-Quantum-Well Laser Fabricated via LPE"; MS received 13 Apr 93, revised 1 Jan 93]

[Abstract] The first successful domestic liquid-phase-epitaxy fabrication of a room-temperature CW 1.48- μ m (or 1478.6-nm) InGaAsP/InP separate-confinement-heterostructure single-quantum well (SCH-SQW) double-channel planar buried heterostructure (DC-PBH) laser diode (LD) is reported. The minimum threshold current at 13°C is 23 mA for a 200- μ m-cavity-length CW LD. Maximum CW output power is 18.8 mW per facet at 18°C without mirror coating; corresponding values for threshold current and external differential quantum efficiency are 59 mA and 12 percent (single facet), respectively. For a pulse output peak power exceeding 50 mW (pulse width 1 μ s, frequency 1 kHz), power saturation does not occur. The thicknesses of the active layer and transition layer in the SQW structure are 20 nm and 3 nm, respectively.

Figures 1-6, not reproduced, show a schematic band diagram of a SCH-SQW structure, an SEM photomicrograph of a DC-PBH structure, the photoluminescence spectrum, the lasing spectra of a SCH-SQW LD fabricated via LPE, the lasing spectra at 75 mA injection current, and a graph of light output power vs injection current. There are no tables.

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LD-Pumped Nd:YAG Microchip Laser With 62.5-mW CW Output Power

94P60191C Shanghai ZHONGGUO JIGUANG [CHINESE JOURNAL OF LASERS] in Chinese Vol A21 No 1, Jan 94 pp 5-6

[Article by Shan Zhenguo [0830 2182 0948], Shen Xiaohua [3088 1420 5478], et al. of the CAS Shanghai Institute of Optics and Fine Mechanics, Shanghai 201800: "LD-Pumped Nd:YAG Microchip Laser With 62.5-mW CW Output," supported by grant from NSFC; MS received 3 Mar 93, revised 14 Apr 93]

[Abstract] The first successful domestic room-temperature operation of a Nd:YAG microchip (700 μ m long) laser pumped by a laser diode (LD) is reported. Maximum CW output power for the 1.06- μ m-wavelength microchip laser is 62.5 mW for a pump power of 340 mW, indicating an overall optical-optical efficiency of 18.4 percent. The experimental set-up and results are given and the primary properties of LD-pumped microchip lasers are discussed.

Figure 1 below shows a schematic of the Nd:YAG microchip laser. Figure 2, not reproduced, is a graph of output power vs input power for a LD-pumped CW Nd:YAG microchip laser.

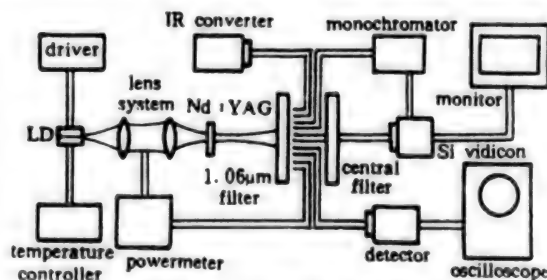


Figure 1. Schematic of the Nd:YAG Laser

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1. Shan Zhenguo, Huang Guosong, et al., ZHONGGUO JIGUANG [CHINESE JOURNAL OF LASERS], 1991, 18 (8): 574.

Microelectronics

Analysis of 1994 Domestic IC Market

94P60195A Beijing JINGJI RIBAO [ECONOMIC DAILY] in Chinese 7 Mar 94 p 7

[Unattributed article: "Analysis of Nation's Integrated Circuit Market for 1994 (Part 2)"]

[Summary] According to authoritative sources in the Ministry of Electronics Industry (MEI), this year's statistics indicate enormous growth for IC applications in communications equipment and other investment-grade products. Following are figures for communications equipment:

1. Stored-program-controlled (SPC) telephone switches: estimated 1994 output of 12 million lines and 100-110 million ICs.
2. Telephones: current domestic annual production capacity is 30 million sets, with actual annual worldwide sales of 20 million sets. The present market for domestically made telephone ICs is 67-71 million chips.
3. Fax machines: using an average of 20 chips per machine, the 300,000 fax machines made annually in China account for 8 million ICs.
4. BP [expansion not given] machines, Dageda [mobile communications] units, optoelectronic terminals, fused optical fiber splicer cost meters, and other communications (including satellite ground station) instruments and meters: 12-16 million chips.
5. Transportation/mining communications equipment, electric power load control meters, home PCs, textile meters, etc.: [approximately 40 million].

The above categories total an estimated 240 million ICs for 1994. The estimate for ICs used in all investment-grade products is 445 million chips. The percentage of domestic investment-grade-product ICs [relative to all domestically made ICs] has risen from 39 percent in 1992 to an estimated 43 percent this year.

In the area of application-specific integrated circuits (ASICs), some breakthroughs have been made this year in independent design. Qinghua [University Microelectronics Institute] is now developing a fax machine thermal-inductance-head LSI ASIC at its 1- μ m fabrication line, Qinghua [University] Huahuan [5478 3883] Electronics Ltd. is now carrying out R&D of ASICs for DS4 and DS5 [i.e., 140 Mbps and 565 Mbps, respectively] fiber optic communications equipment, Southeastern University's ASIC Systems State Engineering Research Center is now developing an IC for a Chinese-language BP machine and two codec circuits (TP3040 and TP3057) for user boards in SPC switches, Beijing IC Design Center has developed the world's highest-grade [8-bit] monolithic computer (the 89C51) [BI/AT μ 89C51 in full] and an LCD driver [the BJ7211AM 4-bit 7-segment LCD driver; see JPRS-CST-94-006, 11 Apr 94 p 16], and Beijing University's Microelectronics Department is developing a GHz-class high-speed ECL [emitter-coupled logic] circuit. Finally, domestic 2- μ m, 1.65/1.2- μ m, 1.0- μ m, and 0.8- μ m production technologies are now being tackled in an intense R&D program.

Development Status of Domestic LCD Industry

94P60195B Beijing ZHONGGUO DIANZI BAO [CHINA ELECTRONICS NEWS] in Chinese 7 Mar 94 p 3

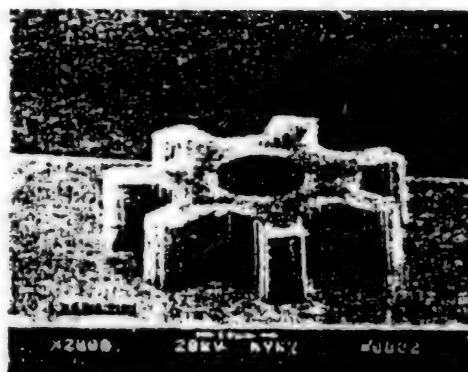
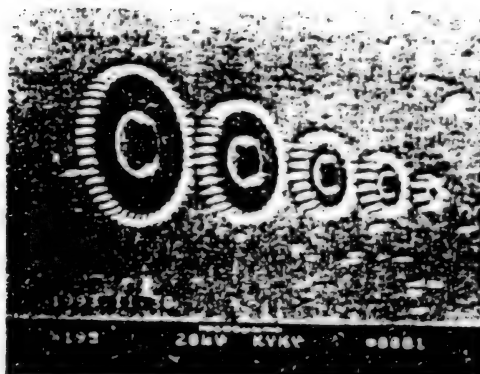
[Unattributed article from MS provided by "LCD Technology Industrialization and Development Strategy Research" Topical Group: "Development Status of Nation's Liquid-Crystal Display Industry," with sidebar by Tong Xinyuan [4547 0207 0337]: "Huashu Group's Optoelectronics Products Making a Name at Home and Abroad"]

[Summaries] [Main article]

China now has 50 units engaged in production and research of TN[twisted-nematic]-LCDs. The 29 production lines have an annual capacity of 292 million instruments- and meters-oriented displays, representing an output value of US\$240 million. STN[supertwist-nematic]-LCDs and AM[active-matrix]-LCDs are not yet being mass produced domestically, although some plants, research institutes, and universities have developed small STN-LCDs and early AM-LCD prototypes. Domestic technology in these areas is about 10-15 years behind the foreign state-of-the-art. Current domestic LCD lines basically manufacture 7 x 7-inch and 7 x 14-inch displays, with a few facilities making 14 x 14-inch displays. The 11 STN-LCD and one AM-LCD production lines now being built or soon to be built with the cooperation of U.S. and Japanese firms should all be completed in 1994 at a total investment of 1.9 billion yuan. The STN-LCD lines, most of which each have an annual output of several hundred thousand devices and modules, will all produce VGA (640 x 480-pixel) B&W models, principally oriented to notebook computers. Two major problems are uncertain [future] market capacity and the question of whether or not domestic products' performance-to-cost ratio can exceed that of the Japanese products with which they will be in head-on competition. AM-LCD manufacturers require an investment of at least US\$200 million and a 200-odd-person high-tech-capable work force, and will not be appearing in any numbers until early in the Ninth FYP with the help and organization of the State.

[Sidebar]

The greater-Chongqing Huashu [5478 5771] Optoelectronics Group, formed in 1987, is rapidly making a name with its high-tech optoelectronics products, especially CCDs and CCD cameras. Foreign exchange earned from products exported to the United States, [the Republic of] South Africa, Pakistan, Hong Kong, and other countries has now surpassed US\$10 million. This group, supported by the Chongqing Municipal Government and other authorities, consists of MEI's Institute 44, Chongqing Radio Plant No. 3, the Chongqing Optical Instruments Plant, MPT's Chongqing Communications Equipment Plant, and Sichuan Meters Plant No. 6. Huashu Group members have trial-manufactured several types of standard-pixel-count TFT-LCD [thin-film transistor LCD] devices, making China the world's third nation—the first two being the United States and Japan—to master TFT-LCD manufacturing technology. Last October, the group acquired exclusive selling rights for imports and exports.



"Five LIGA-Micromachined Gear Patterns Shown at Left; Detail of One Gear at Right"

LIGA Micromachining Advances Reported by Hefei State Synchrotron Radiation Laboratory

94P60206B Beijing ZHONGGUO KEXUE BAO [CHINESE SCIENCE NEWS] in Chinese 14 Mar 94 p 1

[Article by Nai Xin [0035 0207]: "Breakthrough in Deep X-Ray Photolithography Achieved by Hefei State Synchrotron Radiation Laboratory", for previous reporting on the LIGA technique, see JPRS-CST-93-017, 21 Oct 93 p 13]

[Summary] The LIGA [lithography, electroplating, and plastic forming; acronym from German Lithographie, Galvanoformung, Abformung] Topical Group at the Hefei State Synchrotron Radiation Laboratory has reported a major advance in deep-X-ray lithography micromachine fabrication. Using their independently developed X-ray masks, these scientists have fabricated a series of photoresist gear patterns (shown in the accompanying two photographs). Among these gears, the maximum diameter is 200 microns and minimum diameter is 35 microns; thickness of all the gears is 50 microns. This achievement was necessarily preceded by successful experiments in development of thick photoresists as well as X-ray lithography masks.

LIGA-fabricated micromachines have a number of promising applications in fields such as agriculture, space, automation, the automotive industry, and microelectronics. With these possibilities, the LIGA micromachining technique has attracted much attention recently in several advanced nations, with laboratories in Germany and the U.S. having reported fabrication of a number of micromachine varieties (such as microsensors, micromachine parts, micromotors, and micro photonic integrated devices).

Domestic 400-MHz High-Write-Speed Oscilloscope Unveiled

94P60206A Beijing ZHONGGUO DIANZI BAO [CHINA ELECTRONICS NEWS] in Chinese 11 Mar 94 p 1

[Article by Meng Xin [1322 2946]: "400-MHz High-Write-Speed Oscilloscope Unveiled"]

[Summary] A domestic 400-MHz high-write-speed oscilloscope developed by Shanghai Radio Plant No 21—the nation's first such high-bandwidth oscilloscope, and a major advance over the 300-MHz units long available here—was formally certified on 3 March by MEI in Beijing. This

high-speed instrument, with many applications in areas such as aeronautics, communications, and modern physics, has a recording speed of 10 cm/ns. The technical experts certified that this oscilloscope's main performance indicators meet or approach those of current similar foreign-made instruments.

Intel, Huajing Group Form Joint Venture to Produce CPU Chips

94P60206D Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 31 Mar 94 p 1

[Article by Ji Hongguang [1323 3163 0342]: "China, U.S. Cooperate to Produce CPU Chips in China"]

[Summary] Beijing, 29 Mar—China's largest microelectronics firm, the Huajing Electronics Group, and the world's largest semiconductor maker, the Intel Corp., today concluded a technical cooperation agreement and signed a contract. The formal ceremony at the Great Hall of the People was attended by State Council Vice Premier Zou Jiahua, who offered his congratulations. According to the agreement, Intel will provide Huajing with technology and training support and assist Huajing with packaging and testing of 386SX microprocessor chips and 8-bit microcontroller chips furnished by Intel, thereby putting an end to China's history of being unable to manufacture such microprocessor chips (CPUs). It is understood that in the initial phase of the joint venture, Huajing will annually produce 300,000 386SX chips and 2 million 8-bit [microcontroller] chips.

National Semiconductor to Set Up Office, Joint Venture in China

94P60206C Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 15 Mar 94 p 4

[Article by Chen Jian [7115 0494]: "U.S. National Semiconductor Ltd. to Set Up Joint Venture in China"]

[Summary] The ribbon cutting for the formal opening of National Semiconductor's Representative Office in Beijing took place a few days ago, with NPC Standing Committee Vice Chairman Wang Guangying, China International Trade Promotion Committee Chairman Zheng Hongye [6774 7703 2814], and U.S. Ambassador Stapleton Roy in attendance. According to information disclosed by National Semiconductor governor Dr. Ou Mianguo [2962 0517 0948], in addition to the office in Beijing, the firm plans to

establish a joint venture in Shanghai. This Shanghai facility is scheduled by 1995 to begin manufacturing subscriber line interface modules (SLIMs) with an annual output of 3 million units. (At present, the firm can supply China with 150,000 SLIMs on average monthly).

Telecommunications

Construction of Information Highway Seen as National Priority

94P60189A Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 4 Mar 94 p 5

[Article by staff writer Xie Ning [6200 1337]: "Construction of an 'Information Highway' Is an Urgent Matter for China"]

[Excerpt] [Passage omitted] In view of another challenge in the international high-tech development battle, and considering the surging wealth brought on by the information industry, construction of a domestic "information highway" and development of an indigenous information industry have become the order of the day. The information industry in China is still in a start-up phase but the government is paying increasing attention toward building this industry. Party and government leaders have issued numerous major statements on the topic, and officials have begun formulating appropriate strategies and plans, such as the [Ministry of Electronics Industry's] "Three Golden" projects [i.e., the "Golden Bridge" national public information network linking ministry- and provincial-level specialized databases, the "Golden Card" payment system for bank credit cards, and the "Golden Customs" economic information network for foreign trade] oriented toward building a paperless commerce and electronic data interchange (EDI); in other words, government establishment of major information industry projects.

Similarly, faced with major development trends in the world information industry, sensitive entrepreneurs fall into deep thought and then begin to take action. Beijing Guolian [0948 5114] S&T Enterprises Ltd. has already amassed some expertise in building an information highway suited to national circumstances. A few days ago, this firm's General Manager Zhou Xiwei [0719 6932 5898] told this writer that accelerating the construction of China's information highway is necessary to catch up with and overtake the developed countries of the world and to meet the challenge of the world's high-tech revolution. However, this is a trans-century project involving a huge investment. There is one point of utmost importance: whether for the United States or for other countries, work revolving around building an information highway does not progress from a fresh start—from zero. Rather, it is based on existing information systems, to which are added more advanced, faster, more efficient new hardware environments and corresponding software packages. In this regard, the nation must rely on all the strengths in its society and coordinate actions guided by a definite strategic plan. Under this plan, the stronger firms during the process of building a characteristically Chinese information highway should conduct profitable, beneficial probes and take a chance. One hopes that the State as soon as possible will begin deliberations on a comprehensive plan for China's information highway.

A few days ago, at the general headquarters of Guolian, located in the Beijing High-Tech Pioneers Tower, this writer saw [a demonstration of] China's first EDI network, now under intensified development at Guolian. Its data processing center consists of 50 supermicrocomputers forming a parallel distributed information processing system with a three-stage distribution supplying 260,000 user terminals nationwide with real-time searches. It is understood that this network's first-phase project—a book/newspaper/magazine data transmission service network—is now taking shape. The network's data input center can store 7.5 million Chinese characters daily; it can quickly enter abstracts and subject records from books, newspapers, and magazines published throughout the country into the network's database for servicing user searches.

History has furnished China with yet another opportunity for technical development. We must not by any means lose this opportunity to take up the combat. We must as quickly as possible build an indigenous information industry.

First Domestic Soliton Communications Experiment Reported by Qinghua University

94P60208B Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 25 Mar 94 p 1

[Article by Fan Jian [5400 1696]: "First Successful Experiment with Optical Soliton Communications Transmission at Qinghua"]

[Summary] A Qinghua University Department of Electronic Engineering research group led by CAS Academician and noted optoelectronics specialist Prof. Zhou Bingkun [0719 3521 3824] has reported the nation's first successful experiment with optical soliton transmission. Overcoming numerous technical hurdles, the Qinghua group developed a high-quality optical soliton source with a pulse repetition frequency of 2.5 GHz and a high-sensitivity ultra-short-pulsewidth test instrument, which—together with an independently made erbium-doped fiber optical amplifier [EDFA] module—they used in their successful experiment. The experts have agreed that this major breakthrough will do much toward reducing the gap between China and advanced Western nations in this area and will provide an impetus to further domestic development of high-speed, high-capacity, ultra-long-range optical soliton communications technology.

Beijing to Build Asia's First 800-MHz All-Digital Trunking Communications Network

94P60208A Beijing ZHONGGUO DIANZI BAO [CHINA ELECTRONICS NEWS] in Chinese 28 Mar 94 p 1

[Article by Wei Quan [7614 3123] and Wang Zhong [3769 1813]: "Beijing to Build Asia's First 800-MHz Digital Trunking Communications Network"]

[Summary] In order to improve crowded mobile communications in Beijing Municipality, Beijing will build Asia's first 800-MHz all-digital trunking communications network. Beijing Kaiqi [0418 1142] Communications Corp. has signed a US\$125 million contract with Motorola Corp. to import an 800-MHz digital trunking MIRS [Motorola Integrated Radio System]; the formal exchange agreement was concluded on 18 March 1994 in Beijing. According to the

contract, this frequency-division multiplexing/time-division multiple access [FDM/TDMA] mobile communications network—which integrates telephone, FAX, voice mail, simple information services, and computer data transmission—will cover Beijing Municipality with a capacity of 100,000 users.

Telecom Supplier Wants Piece of 'Huge' Market

40100051C Beijing CHINA DAILY (BUSINESS WEEKLY) in English 4 Apr 94 p 4

[Article by Zheng Jie]

[Text] A leading supplier of private automatic branch exchanges, the Shanghai International Digital Telephone Equipment Co. Ltd (Sidtec), is preparing to cash in on the country's fast-growing telecommunications market.

According to managing director Simon J. G. Roper, annual production capacity of the Sino-British joint venture will exceed 300,000 lines by the time it expands to a new plant in the Jinqiao Export Processing Zone in the Pudong New Area around the end of the year.

Roper said the company will introduce a range of new products, particularly cordless ones, to meet demand.

"We will also continue to upgrade the technology and localize the supply of materials," he said.

Set up in 1989 with initial registered capital of \$10 million, Sidtec is jointly-funded by GPT, a multinational British telecommunications company; CITIC Technology, a division of the China International Trust & Investment Corp; and the Ministry of Post and Telecommunications.

Roper sees tremendous opportunities in China's underdeveloped telecommunications industry.

"The current domestic demand for private exchanges is very high," he said, "and the country's telecom market potential is huge."

"The official figures for switching in China are about 196 million lines by the year 2000. With that, China's telecommunications market is one of the fastest-growing and the largest in the world," Roper said.

According to Roper, business in the region is projected to grow by 15 percent in the next two or three years.

Pudong will be a new growth area for the company's local marketing strategy, Roper said.

Roper said expansion of the export market, which is presently "very small," will also be on the agenda but considering the company's capacity, priority will be given to the huge domestic market.

Roper expressed full confidence that the company's high-tech products will remain competitive.

"Compared to our competitors, most of whose products have basic functions, we have very high features," Roper said.

"That is the growth part of the market in China."

Last August Sidtec became the country's first foreign-funded joint venture to pass the ISO9000 quality appraisal and in November it received the BSI quality certificate from the UK.

Though declining to give details, Roper described business in the past four years as satisfactory, saying it exceeded the targets set in the feasibility study for the project.

The company distributes its products all across the country, and its clients include many government institutions and large-scale businesses.

Development of Prototype Ku-Band Satellite-Borne 4-Feed Shaped-Beam Antenna

94FE0423A Beijing ZHONGGUO KONGJIAN KEXUE JISHU [CHINESE SPACE SCIENCE AND TECHNOLOGY] in Chinese Vol 13 No 6, Dec 93 pp 36-42

[Article by Bu Binlong [0592 2430 7893], Zhong Ying [6988 7751], Yi Nianxue [2496 1819 1331], and Ling Minhe [0407 7036 3109] of Xian Institute of Space Radio Technology: "Development of Prototype Ku-Band Satellite-Borne 4-Feed Shaped-Beam Antenna"; MS received 20 Apr 93]

[Text]

Abstract

The fundamental basis and constraints for the design of a Ku-band satellite-borne 4-feed shaped-beam antenna are discussed. The discussion is focused on its electrical properties and the design of key components. By comparing the theoretical design to the measured results, this prototype Ku-band satellite-borne 4-feed shaped-beam antenna appears successful. Finally, ideas for future development are presented.

1. Design Basis

According to our plan, China's first Ku-band communications satellite is supposed to be designed as a medium-capacity despun platform communications satellite. The following is a list of technical specifications associated with the satellite-borne antenna.

- (1) Satellite fixed-point location: longitude 101.4° East (backup satellite longitude 105° East).
- (2) Polarization mode: horizontal downlink, vertical uplink.
- (3) Communication band: 11.2-11.7 GHz downlink, 14.0-14.5 GHz uplink.
- (4) Service area: primarily mainland China, as well as Taiwan and Hainan Island.
- (5) EIRP (85 percent service area): not less than 38 dBW.

2. Basic Constraints and Design Concept

The basic constraints and design concept of the Ku-band satellite-borne communications antenna are:

- (1) The satellite is a despun platform satellite. The aperture of the satellite-borne antenna is less than 1 m. It is for both transmitting and receiving (T/R).
- (2) A shaped-beam antenna is selected. The gain along the fringe of the service area must reach 25 dB.

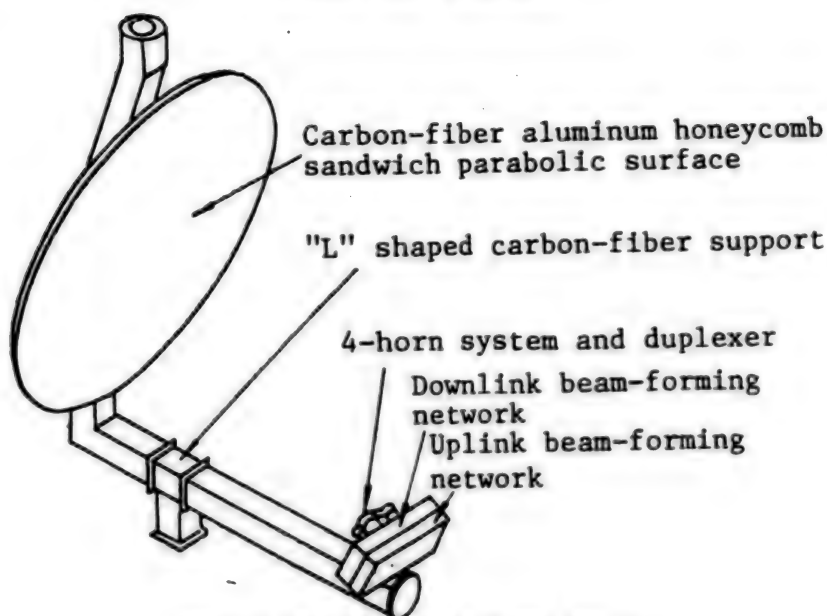


Figure 1. 4-Feed Shaped-Beam T/R Antenna

- (3) The shaped beam is used in both uplink and downlink direction.
- (4) Considering the fact that the East has a higher communications load and Ku-band rain attenuation, the voltage should be higher in the East.
- (5) The coverage voltage over Taiwan should be as high as possible.

3. Design of Shaped-Beam Antenna

3.1 Selection of Scheme

After taking factors such as existing technology, state-of-the-art, funding, progress and risks into account, the 4-feed shaped-beam scheme described in reference 1 is considered as a feasible approach. Without taking any network loss into consideration, its beam coverage diagram shows that more than 89 percent of the country is covered at 27 dB or above. More than 30 percent of the country is covered by 30 dB or above; this includes most of the East. Figure 1 shows the profile of the 4-feed shaped-beam antenna.

3.2 Selection of Antenna Parameters

(1) Aperture Size

Four feeds with circular aperture and offset parabolic feed surface are used to cover the entire country with beams. Figure 2 shows the satellite view that divides China into four areas. Each footprint has a viewing-angle area of approximately $2.5^\circ \times 2.5^\circ$. If each wavelet covers an area, then the aperture of the reflective surface is:

$$D = 63^\circ \times \lambda / 2.5^\circ \approx 680 \text{ (mm)}$$

where λ is the wavelength. By taking the downlink lower-sideband frequency into account, the diameter of the reflective surface should be $D = 684 \text{ mm}$.

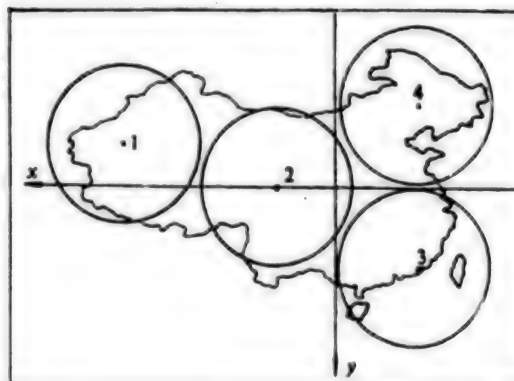


Figure 2. Arrangement of the Four Feeds on the 101.4° E Longitude Satellite

(2) Focal Length

For a multi-branch shaped-beam antenna, the focal length F is selected by way of beam design. The longer the focal length is, the lower the cross-polarization of the reflective surface is. However, the antenna becomes too large if the focal length is too long. The constraint is often the available space on a satellite. In this work, F is selected to be 700mm.

(3) Offset Height

Offset height should be selected based on the principle that there is enough room for the feed system. In other words, the premise is that the feed should not be blocked. For this antenna, the offset height $D_c = 385\text{mm}$.

(4) Horn Size and Beam Optimization

In accordance with the procedures for individual horn size selection and feed-array optimization described in reference

1, the outside diameter of the horn is calculated to be 36.8mm. In this case, the horn diameter is chosen to be 36 mm. This diameter is approximately 1.7λ with respect to the uplink frequency and 1.4λ with respect to the downlink frequency. Figure 2 shows the arrangement of the feeds from the perspective of the satellite.

The excitation parameters of the feed are optimized according to the beam-optimization procedure described in reference 1. The beam coverage rate obtained is shown in Table 1. Table 2 shows the position and feed parameters for each feed. For ease of comparison with measured results, the center-frequency beam coverage is also shown in Figure 3.

Table 1. Calculated Beam Coverage Rate (minus 0.6 dB of feed loss)

Coverage rate (%)		Downlink frequency/GHz			Uplink frequency/GHz		
Fixed satellite position		11.20	11.50	11.70	14.00	14.25	14.50
27 dB (voltage)	101.4° E	87.9	85.9	86.3	86.7	87.1	87.3
	105° E	83.5	84.4	85.3	86.2	86.3	86.4
30 dB (voltage)	101.4° E	31.6	32.4	32.5	40.5	41.2	42.4
	105° E	31.8	32.3	32.6	40.6	41.4	42.6

Table 2. Position and Feed Parameters for Each Feed

Feed number	Position parameter (original at beam center)		Downlink feed parameters		Uplink feed parameters	
	Polar radius (R)/mm	Polar angle (ϕ)/(°)	Amplitude/(dB)	Phase/(°)	Amplitude/(dB)	Phase/(°)
F-1	50.39	348.88	-6.32	0.0	-8.04	0.0
F-2	13.89	0.00	-6.02	0.0	-5.15	0.0
F-3	25.78	134.45	-6.02	0.0	-6.02	0.0
F-4	25.78	225.55	-5.65	0.0	-5.41	0.0

Our calculations show that the 4-feed shaped-beam antenna designed can accommodate both fixed locations at 101.4° E and 105° E. The center of the 101.4° E beam is 108.28° E and 32.38° N and its corresponding antenna directivity is 5.3° and 1°. The center of the 105° E beam is 108.43° E and 32.35° N and its corresponding antenna directivity is 5.3° and 0.5°.

4. Feed Network Design

4.1 Feed Network

The 4-feed shaped-beam feed network is comprised of a 4-horn system, a T/R duplexer, a downlink beam-forming network and an uplink beam-forming network. The 4-horn system is an array of four conical horns. The center of the horn array is located at the focus of the reflective surface. The center of each horn, its feed amplitude and its phase relation are determined by beam optimization. With the exception that the horn position must be identical for uplink and downlink beams, the relation between amplitude and phase is optimized independently and is individually ensured by its own beam-forming network. The uplink and downlink beam-forming networks are each comprised of three power dividers, six phase shifters and a number of angled waveguides. The uplink and downlink beam-forming networks are connected by four T/R duplexers. They feed into the common horn array to be used for transmission and reception in conjunction with the reflective surface.

To reduce its size and weight, and to strengthen its mechanical properties and improve its reliability, the entire network is made of an integrally formed multi-layer modular structure. Its waveguide transmission-line loss is low and the Ku-band size is small. Furthermore, the microwave components in the waveguide are designed to facilitate software development in order to make the actual device behave

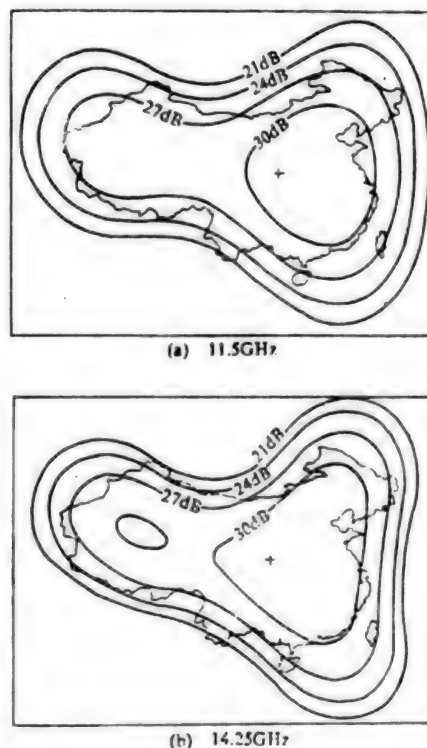


Figure 3. Theoretical Beam Coverage Diagram at 101.4° E

more like the theoretical design. Thin-wall waveguide transmission lines are used for components in the beam-forming

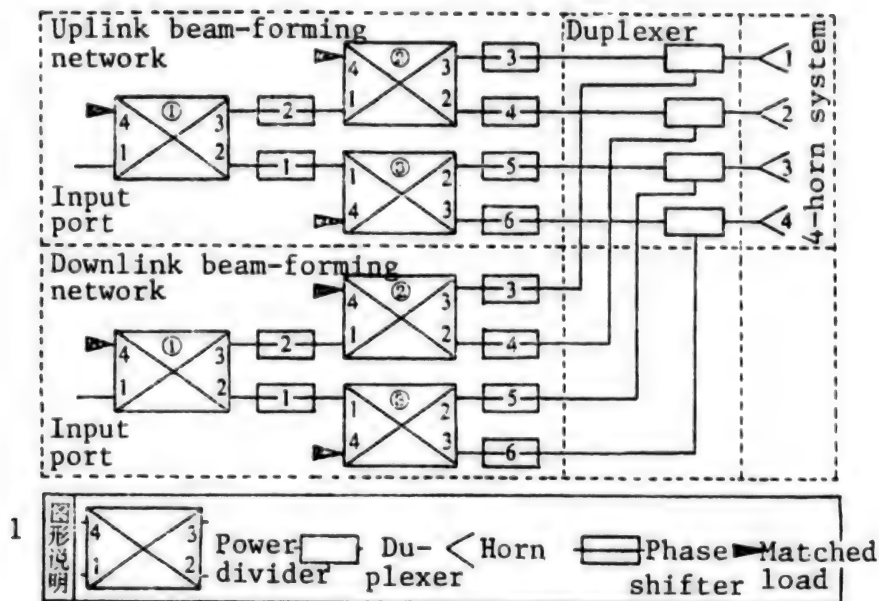


Figure 4. Schematic of the 4-Feed Shaped-Beam Feeder Network

Key: 1. Graphical Description.

network. Figure 4 shows a schematic diagram of the 4-feed shaped-beam feeder.

4.2 Design of Key Components

(1) Power Divider

A power divider is the key component of a beam-forming network. There are rigorous requirements for its size, weight and electrical characteristics. In order to ensure excitation, the amplitude and power distribution of each feed must be arbitrarily variable. To improve the EIRP on Earth, the downlink beam can sustain a higher power capacity. In the Ku-band, the thin-wall waveguide E-face T-shaped multi-branch directional coupler is compact and lightweight, has a high power capacity and can achieve any power ratio. Accurate analysis and design can be done using mode-matching and microwave network analysis techniques. Software analysis can be easily performed as well. It should be considered as a first priority.

Design software for an E-face, T-shaped multi-branch waveguide has already been successfully developed. The waveguide structure and electrical principle are shown in Figure 5.

(2) T/R Duplexer

The uplink and downlink beams are perpendicularly polarized and the same antenna is used for both transmitting and receiving. Hence, an orthogonal mode coupler can be used as the duplexer.

The duplexer designed has openings at the two perpendicular polarization locations and the corresponding waves are polarized through coupling. Figure 6 shows its external appearance. For improved isolation, insulating plates are installed on the outside. Matching of the coupling aperture relies on the resonance window.

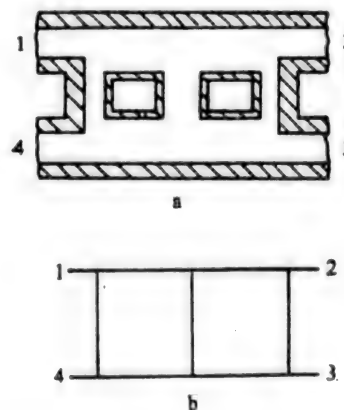


Figure 5. Schematic Diagram and Electrical Principle of a Power Divider

a—schematic of a power divider; b—electrical principle of a power divider

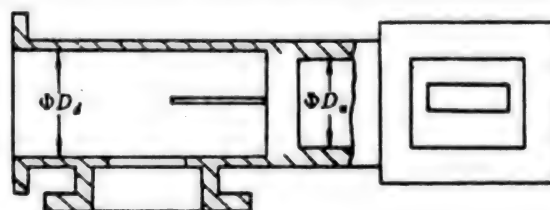


Figure 6. Schematic Diagram of the T/R Duplexer

The diameter, D , of the circular waveguide in the duplexer should satisfy the following condition:

$$\lambda_H/2.613 > D/2 > \lambda_L/3.412$$

where λ_H and λ_L are the wavelengths at the upper- and lower-sideband frequencies, respectively.

For downlink beam, $\lambda_L = 26.8\text{mm}$, $\lambda_H = 25.6\text{mm}$, i.e., $19.6 > D_d > 15.7$. For uplink beam, $\lambda_L = 21.4\text{mm}$, $\lambda_H = 20.7\text{mm}$, i.e., $15.8 > D_u > 12.6$. To make the transition

from uplink waveguide to downlink waveguide easier, we choose $D_d = 17\text{mm}$ and $D_u = 15\text{mm}$.

5. Prototype Test Results

5.1 Shaped-Beam Feeder

The downlink standing wave ratio (SWR) is ≤ 1.18 at 11.2-11.7 GHz and the uplink SWR is ≤ 1.2 at 14.0-14.5 GHz. Table 3 shows the amplitude-phase frequency characteristics of the beam-forming network (with duplexer).

Table 3. Amplitude-Phase Frequency Characteristics of the Beam-Forming Network (with duplexer)

Symbol	Circuit		Downlink			Uplink		
	Frequency/GHz		11.20	11.50	11.70	14.00	14.25	14.50
F-1	Amplitude/dB	Theoretical	-6.15	-6.35	-6.33	-8.02	-8.02	-8.00
		Measured	-7.15	-7.35	-7.42	-9.28	-9.29	-9.18
	Phase/(°)	Measured	0	0	0	0	0	0
F-2	Amplitude/dB	Theoretical	-6.04	-6.02	-6.02	-5.15	-5.16	-5.13
		Measured	-6.45	-6.57	-6.56	-6.00	-6.01	-6.12
	Phase/(°)	Measured	5	1	-2	6	0.2	-4.5
F-3	Amplitude/dB	Theoretical	-6.08	-6.04	-6.07	-6.03	-6.04	-6.03
		Measured	-6.46	-6.57	-6.55	-6.60	-6.76	-6.68
	Phase/(°)	Measured	10	-2	-11	-4	-0.3	1
F-4	Amplitude/dB	Theoretical	-5.93	-5.68	-5.73	-5.43	-5.44	-5.48
		Measured	-5.82	-5.85	-5.81	-5.24	-5.23	-5.22
	Phase/(°)	Measured	-7	1	8	2.5	0.5	0
Insertion loss/dB		Measured	-0.42	-0.53	-0.53	-0.52	-0.56	-0.55

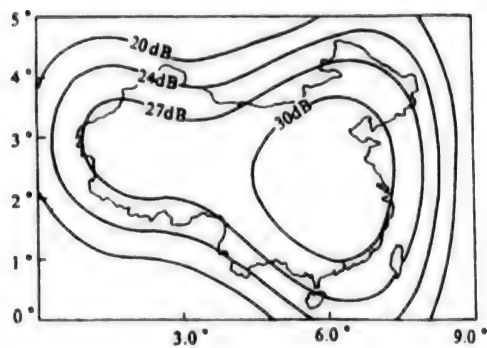
5.2 Measured Beam Coverage Pattern

Adjusted beam-forming networks and horns were placed in the pre-determined focus of an offset reflective surface.

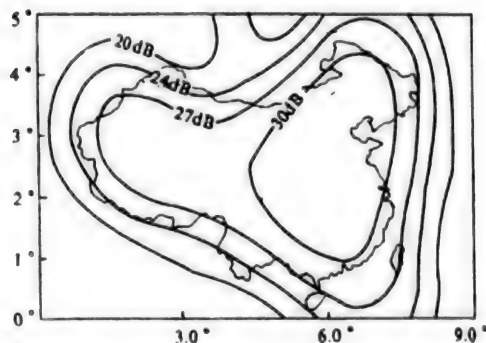
After the optics were calibrated, measurement of the beam-coverage pattern was completed in March 1992. Table 4 shows the measured beam-coverage values. The measured beam-coverage percentage at its center frequency is illustrated in Figure 7.

Table 4. Measured Beam-Coverage Percentage

Coverage rate (%)	Downlink frequency/GHz			Uplink frequency/GHz		
Voltage/dB	11.20	11.50	11.70	14.00	14.25	14.50
27	85.6	85.9	86.1	84.2	85.3	85.6
30	34.7	34.9	35.1	40.9	39.8	37.6



(a) 11.5GHz



(b) 14.25GHz

Figure 7. Measured Beam-Coverage Pattern

5.3 Analysis of Results

A comparison of Figure 3 to Figure 7 and of Table 1 to Table 4 shows the measured voltage coverage in the West is lower than the design value and that in the Northeast is higher than the design value. The discrepancy is due to the fact that the actual power divider is not an exact match with its theoretical design. The degree of coupling of the coupling arm of the power divider is generally lower (by 0.4 dB downlink and 0.5 dB uplink). After secondary power division, the cumulative power distribution in the West is 1 dB less than the design value and that in the Northeast is higher. Therefore, the same discrepancy shows up in the directivity pattern. This indicates that the theoretical design and precision of processing need to be further improved.

6. Future Ideas

Despite successful development of a prototype antenna, a great deal of work still needs to be done to develop a real product. For example:

- (1) The prototype beam-forming network is comprised of discrete components with many structural links. Although this makes it easier to adjust and fine tune, it is not tolerable as a satellite-borne antenna as far as volume, weight and reliability are concerned. It must be designed as a multi-layer module and processed in bulk.
- (2) The waveguide power divider software needs to be perfected. A "centralized" design should be adopted to provide machining tolerance and performance characteristics within machining tolerance.
- (3) The antenna support should be designed using the satellite coordinate as the basis.

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Physics

Radioactive Secondary Nuclear Beam Apparatus Built

94FE0262B Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 30 Nov 93 p 1

[Article by reporter Fan Li [5400 0500] and correspondent Hu Lin [5170 3829]: "China's First Radioactive Secondary Nuclear Beam Line Built"]

[Text] Investigators at the China Institute of Nuclear Power have built China's first radioactive secondary nuclear beam device. On 20 November they succeeded for the first time in obtaining beams of the radioactive nuclei carbon-11 and fluorine-17. The principal characteristics of the device met design specifications.

Radioactive nuclear beams are a cutting-edge area of research in nuclear physics both in China and abroad. They involve research on the more than 2000 nuclides that can be produced by directing a beam of stable nuclei against a target. The "new bullets" of the radioactive nuclear beam

apparatus will greatly increase the breadth and depth of research in nuclear physics. They are the only means of producing and studying thousands of as yet undiscovered new nuclides, and they provide an unprecedented opportunity for investigating cosmic evolution, nuclear structure and nuclear reactions, and for developing nuclear theory.

Only a handful of laboratories in the United States and Japan have built such radioactive secondary nuclear beam devices and used them in research. This most recent advance in basic research by China's Institute of Nuclear Power moves China into the world forefront in this area of nuclear physics research.

National Developments

1993 Capital Construction Investment in Electric Power

94P60183 Beijing GUANGMING RIBAO in Chinese
3 Mar 94 p 1

[Text]

Unit 100 Million Yuan	
Total Capital Construction Power Investment	519.20
Hydroelectric Power	130.20
Thermal Power	285.88
Transmission/transformation	88.58
Other	14.54

Source: Ministry of Power Industry

1993 Power Production

94P60184 Beijing GUANGMING RIBAO in Chinese
1 Mar 94 p 1

[Text]

Total 1993 Power Output	815 Billion Kilowatt-hours
Hydropower	144 Billion Kilowatt-hours
Thermal Power	671 Billion Kilowatt-hours

According to these figures, provided by the Ministry of Power Industry and current through 31 December 1993, total power output exceeded the State Plan by 1.88 percent and represents a 9.84 percent increase over 1992.

State Set To Expand Exploration for Energy

40100043B Beijing CHINA DAILY (Economics)
in English 19 Mar 94 p 2

[Article by Pei Jianfeng]

[Excerpt] China's rapid economic growth will present outstanding opportunities for countries and regions in the Pacific Rim.

The country's expansion will lead to rapid development of coal, oil, natural gas, nuclear power and its mining and smelting industries, according to organizers of the Sixth Minerals and Energy Forum.

The symposium, sponsored by the Pacific Economic Cooperation Council (PECC), ended yesterday in Beijing.

During the two-day meeting, Chinese officials introduced plans to develop its energy and minerals industries.

They noted the demand for energy and minerals will soar by the end of the century.

They said the government encourages domestic enterprises to tap foreign funds, technology and management to ease current and predicted shortages.

It is estimated the annual demand for coal will reach 1.23 billion tons in 1995 and hit 1.4 billion tons in the year of 2000.

To meet this burgeoning demand, China will pump 200 billion yuan (\$23 billion) in the coming years to build 20 energy bases and 15 key mines, said Fan Weitang, Vice Minister of Coal Industry.

About 19 large projects, including 14 pit-mouth power plants and three coal mines are being offered for development with foreign investment.

The Ministry also is considering the construction of a 300-kilometre-long pipeline for transporting coal from Yuxian County in Shanxi Province to Weifang, Shandong Province.

Some U.S. companies have shown interest in investing in this project.

ABB To Invest \$500 Million in Country's Power Sector

40100044B Beijing CHINA DAILY (Business Weekly)
in English 21 Mar 94 p 1

[Article by Hong Xia: "ABB Is To Invest \$500 Million in 12 New Joint Ventures"]

[Excerpts] Copenhagen—ABB [Asea Brown Boveri Ltd], one of the world's leading electrical engineering companies, will invest \$500 million to establish 12 joint ventures in China.

ABB's executive vice-president, Goran Lundberg, said the specific projects and locations are still being negotiated.

When cooperative partners are found, Lundberg said, ABB will pump in the investment to help China manufacture advanced power equipment, such as power transformers, switching gear, boilers and turbines.

ABB is also discussing with Chinese authorities the sale of high-speed trains to the country or help in manufacturing them.

With a speed of 250 kilometres an hour, such trains would cut the travelling time between Beijing and Shanghai from 18 hours to six.

"Fast-growing China is emerging as one of the world's largest markets," ABB President Percy Barnevik said at a press conference in Copenhagen.

With strong double-digit growth in its gross national product, China has become the world's largest market for power plants, demanding 18,000 megawatts more each year.

Last year, ABB took nearly \$140 million in orders from China and Hong Kong, up 40 percent over 1992, and gross revenue jumped by 68 percent to more than \$140 million.

ABB has already set up five joint ventures in China, including ABB Hefei Transformer and ABB Beijing Drives Systems. It also has nine offices in big cities such as Beijing, Shanghai and Guangzhou.

ABB has provided China with modern infrastructure equipment and industrial automation systems, including the country's first high-voltage direct current transmission line—from Gezhouba in Hubei Province to Shanghai—and machinery for Shanghai Volkswagen Automotive Co.'s paint finishing plant. [passage omitted]

The group is represented in the Chinese mainland and Hong Kong by ABB Holding Ltd, based in Hong Kong.

Major Construction, Investment in Jiangsu, Anhui, Zhejiang

946B0045B Shanghai JIEFANG RIBAO in Chinese
5 Jan 94 p 5

[Article by special reporter Zhang Ke [1728 4430]]

[Excerpts] Beijing news report: The 72-hour test run of the No. 2 300MW unit of the Changshu power plant was successfully completed on 20 December 1993. Jiangsu Province's 1993 plan was to get 2,000MW of generating power operating and into the grid, and 1,700MW are now in operation and another 300MW unit now in the operational test phase is about to go into service. This was not only the largest effort by any province in the country last year, but it sets an all-time national record for electric power development for any province or municipality.

Last year, Jiangsu Province followed the model of "Huaneng" in deepening reforms in organizing investments, instilling positivism in all aspects, broadening channels for raising funds, and finding multiple sources for investments in electric power. Last year, a total of 2.38 billion yuan was invested for electric power in Jiangsu, of which national investments were 749 million yuan, Jiangsu raised 1.19 billion yuan, Huaneng and other new power corporation investments were 376 million yuan, and foreign investments were 65 million yuan.

Of the seven units completed and put into operation last year, two of them were 200MW units, three were 300MW units and two were 350MW units. (Huaneng)

Anhui Province is accelerating the development of basic installations and industries by putting emphasis on key construction projects. By the end of last year, over 3.932 billion yuan had been invested in 32 key construction projects in the province, a 36.38 percent increase over the same period of the previous year.

These key projects are mainly for energy, transportation, and raw materials. The first 100 million yuan for the 1 billion yuan large-scale Maanshan No. 2 power plant are in place and start-up construction continues; Phase one of the Pingwei power plant and phase three of the Wuhu power plant are being finished up; the Huainan coal mine is already 44.6 percent over its planned downhole drilling footage for the year, and the Huainan Xinji coal mine, which has a capacity of 900,000 tons per year, is completed and operating three years ahead of schedule.

Investment activity for key projects in Zhejiang is making greater use of the market mechanism, and 3.07 billion yuan were collected between January and November of last year, a 42 percent increase over the previous year. Nearly 4 billion yuan were raised for the year making it the biggest year for construction investments in history.

There were 38 key construction projects underway in Zhejiang last year, mainly for electric power, transportation, posts and telecommunications, and raw materials, for which a total of 3.55 billion yuan have been invested, including 11 projects which received over 500 million yuan, such as the Hang Tong highway, the Jin Wen rail line, and the Anji Tianhuangping pumped-storage power station.

Zhejiang Takes Steps To Address Energy Shortage

946B0060B Hangzhou ZHEJIANG RIBAO in Chinese
28 Jan 94 p 1

[Article by correspondents Yang Xianmin [2799 3759 3046] and Huang Dengxia [7806 3397 1115]]

[Text] Zhejiang's electric power industry must deal with the serious imbalance in supply and demand for electricity through reforms, attention to safety to guarantee efficiency, and development on an extraordinary scale.

The chief actions being taken to effect an extraordinary scale of development in the Zhejiang electric power industry are to assemble forces and get current construction projects into production. This year, Zhejiang will invest 2.53 billion yuan in electric power construction; two units totalling 725MW will go into operation, and 626MW are under construction; 158 kilometers of 500kV power transmission lines, 377 kilometers of 220kV lines, and transformer capability of 1.17 million kVa will go into operation; preparations for new projects are heating up, and this year's new provincial electric power construction projects are on a scale of 1,225MW; efforts are being made to complete construction ahead of schedule, and every effort is being made to get scheduling documents for the Beilun power plant second-stage project, Jiaxing power plant second-stage project, and the Wenzhou power plant second-stage projects done and to get work started by year's end or next year; the Ningbo Yinglongshan power plant construction and design report has to be wrapped up; construction forces have to be lined up, and efforts are being made to get the Jiaxing power plant second stage series work done ahead of schedule.

Guizhou's Strategic Energy Goal: Completion of Southern Energy Base

946B0064A Guiyang GUIZHOU RIBAO in Chinese
17 Feb 94 p 1

[Article by Zhang Junyan [1728 6511 3543]]

[Text] At a conference held by the Guizhou Electric Power Corporation on 18 January, Governor Chen Shineng, and Vice Minister of the Ministry of Electric Power, Wang Shucheng, declared emphatically that Guizhou will become the southern energy base, and that is the reform development strategy desired by the electric power industry, that's what the State Council wants, and that is what the national regional economic development wants.

Chen Shineng said Guizhou has over 50 billion tons of coal reserves, fourth in the country and the largest in the south; and it has over 18,000MW of hydropower resources, sixth largest in the country. It stands, alone among southern provinces for its energy resources. Among the provinces six major economic advantages, thermal and hydropower rank first. For this reason, the State Council and the Ministry of Electric Power are both very interested in the construction of Guizhou's energy industry. Last April, Vice Premier Zou Jiahua came to Guizhou to make an investigation, and firmly proposed that Guizhou become the important energy base for the south.

Guizhou power will be used to satisfy the economic development needs of the province and eventually it will provide the energy needed by the southern and central provinces.

Although Guizhou was strapped for power last year, it supplied 285 million kWh of electric power to Guangdong.

Vice Minister Wang Shucheng said that the strategy for reform and development of China's power industry requires energy-rich provinces to depend on their energy resources to drive their own economic development and for energy-poor provinces to import electric power for their economic development. Reform and development in the electric power industry is now taking this approach. Having analyzed the present level of electric power consumption in Guizhou, Vice Minister Shucheng said, "Guizhou still has a long way to go to become the southern electric power base," and he clarified that by saying, "Full use must be made of Guizhou's energy resource advantages before its energy industry can provide for the economy of the whole province and then meet the needs of national-regional economic development, and that will make it a genuine southern energy base that can realize the goal of sending western energy to the east."

Henan Has 20-Percent Power Shortfall; 15 Million Without Electricity

946B0064B Zhengzhou HENAN RIBAO in Chinese
25 Feb 94 p 2

[Article by Yu Lianhui [0060 6647 7608] and Hao Xincui [6787 1800 2088]]

[Text] At the conclusion of the provincial electric power working conference on 22 February it was proclaimed that electric power construction in the province is at its highest level in history, and the top priority of the moment is to gather forces to complete the electric power construction mission.

By the end of last year, Zhengzhou's installed generating capacity exceeded 8,000MW, seventh largest in the country, and its annual output ranked sixth, but per capita installed capacity and consumption were only 60.3 percent and 74.1 percent of the national average. The electric power "bottleneck" is an important factor hindering economic development and the raising of the standard of living in the province. Various prefectures, as well as Zhengzhou, frequently suspend the use of power. Figures show that Henan has a power shortfall of over 20 percent, and there are still 15 million people who do not have electricity.

The State has arranged for 660MW of installed power to go into operation this year, namely one 300MW unit at the Sanmenxia thermal plant, a 75MW unit at the Sanmenxia hydropower station, a 50MW unit at the Dengfeng power plant, and 235MW in local power plants; of new projects starting up, there are the Kaifeng 1x125MW power plant, Zhengzhou 1x200MW heat and power plant, Anyang 2x300MW power plant, and the Yahekou 2x350MW power plant, which together put the scale of large and middle-sized electric power projects up to 3,000MW, the highest in history for any single year. Meanwhile, the effort is on to get the 2x142MW units under construction at the Loyang power plant this year, and the early stage work for the second stage of the Hebi power plant, fourth stage of the Yaomeng power plant, Qinbei power plant, and the Yuzhou power plant finished up, and get them listed as preparatory target plans to lay a foundation for electric power construction in the "Ninth 5-Year Plan."

Investments of more than 3.5 billion yuan are needed for electric power construction in Henan this year, of which 2.722 billion have been requested from the State. It is so critical to the completion of the electric power construction mission for the whole province to get this needed sum in place in time, especially in the first and second quarters, that every means possible must be used to solve the funding shortfall and guarantee the completion of this year's mission.

Statistics show that the national average output value per kWh in 1992 was 4.46 yuan, and it was only 3.18 yuan for Henan in 1993. Last year, energy consumption for the year was 37 percent higher than the national average, ranking 21st, and to catch up with the national average the output value has to be raised by 105.6 billion yuan.

Hydropower

Work Begins on Dachaoshan—Project Is Crucial to Development of Lancang Jiang Power Base

946B0044A Kunming YUNNAN RIBAO in Chinese
29 Dec 93 p 1

[Article by reporters Liu Liu (0491 3177) and Lu Jianhua (7120 1696 5478)]

[Text] On 28 December 1993, the early stage work for another key project on the Lancang Jiang that will follow the Manwan hydropower station into the next century, the Tachaoshan hydropower station, got off to a start shaking the mountains with the sound of blasting.

The Provincial Committee and Government, the Ministry of Electric Power, and the State Energy Investment Corporation sent congratulatory cables commemorating the start-up to the hydropower project. Governor He Zhiqiang and Vice Governor Niu Shaoyao and other Party and Government leaders arrived from afar via Zhongdian on the upper reaches of the Jinsha Jiang for the ribbon-cutting ceremony.

The Dachaoshan hydropower station, the second 1,000MW-class power station on the Lancang Jiang, will have an installed capacity of 1,350MW and will generate 6 billion kWh per year. It will have a dam 118 meters high and 480.9 meters long at the top with a capacity of 890 million cubic meters. It is estimated that the total investment for the power station will be over 8 billion yuan; 12,000 mu of land will be flooded and 6,100 people relocated, but inundation damage will be slight and its economic indicators are excellent. Construction will be managed through bids and contracts.

The 259-kilometer highway leading to the station from the east was opened all the way in April, the permanent 131-kilometer road from the west was fully paved, the No. 1 bridge at the dam site is open, and the 110 kV transmission line and transformer station are completed, guaranteeing power for the work site. When the 14th Hydropower Bureau won the bidding to build the penstock for the Dachaoshan hydropower station, they immediately set up their manpower, equipment and facilities and went to the work site. On 19 December, three 40-ton flatcars brought the excavating equipment from the east to the work site. The cable platforms on the right and left banks got into the act, and work was underway for the support tunnel for the penstock.

by mid-December, basically setting up the conditions for work to begin on the penstock; 240 million yuan have been raised so far and that provides the basis for starting up the early stage work.

It will be a big power source for Yunnan, will create excellent conditions for industrial and agricultural development, assure a reliable energy supply for the Provincial Committee and Government's strategy of launching the Ninth 5-Year Plan from the foundation of the Eighth 5-Year Plan, and it will be a big boost for the comprehensive development of the Lancang watershed and the economic development of southeastern Yunnan as well.

He Zhiqiang said that the Provincial Committee and Government have a keen interest in the Yunnan electric power industry, and with the support of central authorities and the Ministry of Electric Power, they are eager to develop the rich natural resources of Yunnan and make the power industry into another pillar industry for Yunnan. Since the Eighth 5-Year Plan, a lot of good effort has been put into developing the hydropower resources of the Lancang Jiang and in building a thermal power force in eastern Yunnan. Two units of the Manwan station, the object of much attention in the province, went into operation this year, and Yunnan's first extra-high voltage project, the 500-kV "Man-Kun" power line and transformer system is up and running, a sign that Yunnan's power industry has entered a new era of big grids, big units, extra-high voltage, and high technology. This year, after the first Manwan unit began working, Yunnan joined the grid with Guangdong and began exporting power for the first time. The Yunnan grid, which now serves 10 prefectures and Zhou's, will be extended to cover all of the prefectures, Zhou's, municipalities and counties in the province, and it will take advantage of its proximity to the border to get into the international electric power market.

He Zhiqiang emphasized that Yunnan is rich in energy resources and has a wide open domestic and international electric power market. At present, Yunnan's economy is growing rapidly, but the power industry base is still weak. The construction of Dachaoshan is a key step in Yunnan's economic boom strategy, the schedule for river diversion in 1995 and power generation in 1999 must be met, and efforts must be made to get into operation ahead of schedule. The construction schedule is tight, the engineering problems formidable, and the technology requirements are high.

Fast Action Urged on 200MW Yellow River Station

40100045B Beijing CHINA DAILY (Business Weekly) in English 28 Mar 94 p 6

[Text] A group of experts has urged that construction begin as soon as possible on the controversial Daliushu hydroelectric power station on the Huanghe (Yellow) River in Northwest China.

More than 60 experts called for an early start on the construction in Ningxia Hui Autonomous Region at a meeting organized by the China Association for Science and Technology, which closed in Beijing recently.

Deputies from Ningxia, Shaanxi and Inner Mongolia made the same suggestion at the recently concluded Eighth National People's Congress.

Experts at the meeting of the China Association for Science and Technology—including Zhang Zongyou, Ma Zongjin and Li Tingdong, noted scholars at the Chinese Academy of Sciences—hold that the construction of a hydropower plant at Daliushu in the Heishan Gorge, on the upper reaches of the Huanghe River, is feasible both technologically and economically.

The experts said that because the loose rock base at the site of the proposed reservoir covers only part of the area and is superficial, it poses no major difficulty for construction or safety.

In fact, the experts pointed out that loose rock has been handled successfully at power plants built in China and abroad.

For several decades feasibility studies on the plant have been accompanied by controversies over whether there should be two lower dams at Xiaoguan Yin in Gansu Province and Daliushu in Ningxia, or only one high dam at Daliushu.

The high-dam plan won the argument in November 1991 after experts from the Ministry of Water Resources conducted studies regarding geology, construction, investment and irrigation.

According to the final plan approved by the State Council, the Daliushu station will have a 160-metre-high dam and a reservoir containing 1.1 million cubic metres of water. The dam will have 2 million kilowatts of capacity and will be able to generate 7.8 billion kilowatt-hours a year.

The reservoir will have enough water to irrigate 400,000 hectares of farmland in the short term, and more than 1 million hectares in the long run.

It will also supply power for the energy and chemical industries in Shaanxi, Gansu, Ningxia and Inner Mongolia, and provide cleaner water to hundreds of thousands of residents whose drinking water now contains too much fluorine.

As the plant is of great significance to the development of western China and has been put on the State Council's agenda for agricultural development in the 1990s, the experts urged that construction be started as soon as possible.

Agreement With Austria on Hubei Hydropower Station

946B0056B Beijing JINGJI RIBAO [ECONOMIC DAILY] in Chinese 26 Jan 94 p 1

[Article by Li Zhengping [2621 3630 1627]]

[Text] A contract signing ceremony for the largest water conservancy project undertaken cooperatively by China and Austria, the Hubei Wangfuzhou hydropower station project, was held at the Great Hall of the People on 21 January 1994.

The Wangfuzhou hub project, located in Hubei Province at Laohekou municipality on the main stream of the Xiang Jiang, will be used primarily for generating electric power, but also for navigation, irrigation, animal husbandry, and tourism.

An Austrian Government special project loan of US\$52 million will be used for this project, and the China Machinery Import-Export Corporation as the agent for China will import four 27,300-kilovolt flow-through bulb-type generators from the Austrian (Liyilin) corporation. The

installed capacity of the power station will be 110MW, and it will generate 570 million kWh per year.

Work on Longtan To Begin; Station Will Be Asia's Second Largest

946B0057A Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 16 Feb 94 p 1

[Article by reporter Heng Zhicheng [5899 1907 6134]]

[Text] Work will soon begin on the Longtan hydropower station in Guangxi, a project second in scale only to the Three Gorges hydropower station.

Chairman of the Guangxi Zhuang Autonomous Regional People's Government, Cheng Kejie, revealed that this hydropower station is listed as this year's preparatory construction project. The first stage of construction will include a 375-meter dam, seven 600MW units for a total installed capacity of 4,200MW and an annual output of 15.67 billion kWh. It will later be expanded with two units to reach a total installed capacity of 5,400MW, and will be Asia's second largest hydropower project. The total investment for the project will be 30 billion yuan, which will include a World Bank loan of US\$970 million.

The station will have a large reservoir that can regulate the Hongshui He outflow, which, in phase one, will increase downstream cascade stations' output by nearly 800MW. In the later phase, this will increase to 1,000MW. Besides the generation of power, Longtan will raise the downstream flood standard from a 20-year to a 40-year event span. Longtan hydropower station is a joint venture of the State Energy Investment Corporation and Guangxi, Guizhou, and Guangdong provinces. Guangxi will make 25 percent of the investment and get 50 percent of the power output.

The Hongshui He is a rich area for hydropower resources. With the approval of the State Council, 10 cascade stations will be built on the Hongshui He for a total installed capacity of up to 11,000MW. Many of the 10 large stations are now under construction and the first-stage hydropower projects at Dahua, Wutan, Yantan, and Tianshengqiao are basically completed and in operation.

Li Peng Underscores Importance of Rural Hydropower Electrification Program

94P60175 Beijing RENMIN RIBAO in Chinese 27 Feb 94 p 1

[Text] Beijing, 26 Feb—In a letter today to the National Rural Hydroelectric Electrification Working Conference, State Council Premier Li Peng stressed the need for all departments of the State Council and all levels of government to strengthen leadership, to organize carefully and to cooperate and provide assistance in the effort to make the electrification of 200 counties a major undertaking.

In the letter, Li Peng stated that in the past few years water conservancy departments throughout the nation had tackled hydropower, that hydropower construction had progressed very rapidly, and that every year more than 1 million kilowatts in installed hydropower capacity had been achieved. The implementation of the mission to provide hydroelectricity to the second batch of 200 counties in the initial electrification program had met with encouraging success. He pointed out that the construction of the 200 electrified

counties would bring tremendous economic benefit to the peoples of the vast mountain regions.

With guidance and planning from the State Council and the State Planning Commission, the National Rural Hydroelectric Electrification Working Conference urged water conservancy departments to unify river control and development so that the installation of 15 million kilowatts of hydropower could be achieved by the year 2000, so that the completion of the project to provide 200 rural counties with primary electrification in the Eighth Five-Year Plan could be realized and the goal of providing 300 rural counties with electrification by hydropower in the Ninth Five-Year Plan could be achieved. This year and the next are the crucial time to complete the mission to supply the 200 rural counties with hydroelectricity and to install 15 million kilowatts of hydropower. The Conference requested water conservancy departments everywhere to redouble their efforts in hydroelectric power construction to promote rural economic prosperity.

Thermal Power

Hainan's Nanshan Plant Ready To Generate Power

946B0058C Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 22 Feb 94 p 1

[Article by Zhou Bing [0719 0393]]

[Text] The Nanshan power plant, a key project in Hainan, has reached the shake-down stage and the first 50,000-kilowatt unit will begin generating power on 22 February. The Nanshan power plant will be a big help to the Fenghuang international airport at Sanya, and ease the power shortage situation on Hainan.

Jiangsu's Changshu Plant Adds Another 300MW Unit to Grid

94P60154 Shanghai WEN HUI BAO in Chinese 3 Mar 94 p 2

[Text] On 2 March, the No. 3 generator unit of the Changshu power plant, a major State construction project, joined the grid. The first stage of the Changshu plant calls for the installation of four 300MW steam turbine generators. The operational status of the No. 3 unit will help ease the energy shortage in the Suzhou area and other areas in eastern China where there is a shortfall in electricity supply.

Coal

Foreign Investors Sought To Help Clean Coal Project

40100044A Beijing CHINA DAILY (Business Weekly) in English 21 Mar 94 p 1

[Article by Chang Weimin: "Quest for Cleaner Coal Given High Priority"]

[Excerpts] [Passage omitted] Coal accounts for 76 percent of the nation's energy use, but of the 1.14 billion tons of coal mined in China last year only 18 percent was treated. The rest was used in its raw form.

In addition, most of the nation's 400,000 boilers aren't equipped to treat high-sulphur coal.

Fan [Weitang, Vice-Minister of Coal Industry] said the Ministry of Coal Industry has designated the development of clean coal as a strategic task.

The State Planning Commission, the State Economic and Trade Commission and the State Science and Technology Commission have also listed clean-coal technology as a key project for the 1990s.

In an interview with *Business Weekly*, Fan said China will begin using American clean-coal technology. Negotiations are underway to secure capital and technical assistance from the United States. [passage omitted]

Fan, who is also chairman of the China Coal Society, said the country will adapt foreign technology to Chinese needs.

Fan said the country will make use of all types of techniques, especially those that are low in cost and easy to use. [passage omitted]

"We will have the two things—economic development and environmental protection—balanced, that is, we will properly handle their relationship."

That, he said, means China will not set environmental standards that can't be met. Besides, he said, rules that are too strict would also hamper economic growth.

"We prefer practical approaches," Fan said, adding that China needs to cooperate with foreign governments and businessmen to develop advanced techniques. [passage omitted]

Experts predict that by the year 2000 economic growth will require 1.4 billion to 1.5 billion tons of coal annually, and by 2020, 2.1 billion tons.

Even until the middle of the next century, they said, coal will probably account for 60 percent of energy consumption.

Fan said China is conducting feasibility studies on a programme to turn large quantities of bituminous coal into balls that produce no smoke when burned. The coal balls would contain plant chips, and would be shaped under high pressure.

The Japanese Government has offered equipment, Fan said, but large-scale investment would be needed.

Coal Market Outlook for 1994 Reviewed

946B0056A Beijing JINGJI RIBAO [ECONOMIC DAILY] in Chinese 31 Jan 94 p 7

[Article by reporter Xie Ranhao [6200 3544 3185]]

[Text] On the question of the national supply and demand for coal in 1994, Vice Minister of the Ministry of Coal, Zhang Baoming, had this to say, "Overall it appears that supply will stay ahead of demand."

Based on the situation as described by Vice Minister Zhang Baoming, his judgment appears to be based on three points:

According to preliminary calculations, national coal consumption in 1993 increased by about 43 million tons over the previous year, a 4 percent increase, which guaranteed a 13 percent increase in the gross output value of the economy. The national planned gross output value for 1994 will be 9 percent, and considering the state macro regulation and control measures, and the continued support for an annual energy conservation target of about 40 million tons of standard coal, even if this year's national coal output is maintained at last year's

1.14-billion-ton level, coal supply will be assured. Looking at the major coal users, in 1994, the national electric power generation plan was 890 billion kWh, of which thermal power will be 774.3 billion kWh, coal requirements for the year will be 435 million tons, an increase of 35 million tons over 1993; the metallurgy industry plan calls for 93 million tons of steel and 90 million tons of iron requiring an estimated 102.5 million tons of coal, and increase of 6 million tons of coal over 1993; there will be little increased demand for coal for the construction materials and chemical industries; locomotive and home-use requirements will decrease. With the various localities and businesses in equilibrium, coal consumption will increase only 30 to 35 million over last year, a lower rate of increase than last year or previous years.

As for coal storage, because coal production outpaced demand annually from 1988 to 1992, national coal stores rose from 107.4 million tons at the end of 1988 to 213.1 million tons by the end of 1992, a four-year increase of over 100 million tons. In 1993, after taking about 8 million tons out of storage, the total coal storage volume was still above 205 million tons, 50 million above the desirable volume. Of this volume, key national mines stored 29 million tons, or about 15 million more than is reasonable, and local mines were holding more than 30 million tons more than is recommended.

The outlook from last year's national coal-ordering conference indicates that: in 1994, some coal prices will be freed up in the northwest, southwest, northeast, and Shanxi, and they will come under market regulation. National planned coal allocation volumes will be reduced to 479.97 tons. Consumers at the national coal-ordering conference said they will try to get coal from Shanxi and not so much from east China; they will seek excess coal from over-shipments by railroad and not allocated volumes; and they will put product quality ahead of volume. There was evidence of greater vigor for goods ordered outside of the plan than within the plan, and this signifies that planning mechanism is gradually weakening and market actions are getting stronger by the day.

Having made the above judgments and analysis, Vice Minister Zhang Baoming appealed to all coal system employees, especially the various level cadres, to be responsive to market demands in the study and arrangement of coal production and sales actions, to be thoughtful about policy and organizational systems, keep growth in production in line with the needs of the market, and raise the economic performance of enterprises. Establish forms of enterprise management that are sensitive to the market, sales-oriented and efficient; plan production and sales in keeping with actual customer contracts and delivery capabilities; and reduce this year's coal stores to reasonable levels by every means possible.

Prospects for Coal-Dressing in a Market Economy

946B0062A Beijing MEITAN KEXUE JISHU [COAL SCIENCE AND TECHNOLOGY] in Chinese Vol 22 No 1, Jan 94 pp 53-56

[Article by Yu Ertie [0060 1422 6993], East China Coal Company: "Role and Prospects of the Coal-Dressing Industry Under a Market Economy"]

[Text] Abstract: Coal-dressing is an important measure for improving coal quality, optimizing product structure, making efficient use of coal, and alleviating environmental pollution. It is a necessary step if the coal industry is to meet

the challenge of the market. To achieve all-round development of the coal-dressing industry, an appropriate technological approach must be selected and high-efficiency technologies and equipment must be developed; in addition, markets must be expanded and policy support must be provided.

In the high tide of reform, the state will gradually remove controls on coal prices and move coal mines toward market-based operation. In 1993, the coal mines of Northwest China, which were the first to have controls on their coal prices removed, immediately experienced a rigorous challenge from the markets. In regions where coal was selling poorly, some coal-dressing plants had to decrease output or even shut down temporarily. Under these circumstances, some coal mine managers are uncertain whether coal-dressing represents stagnation or development. In order to answer this question, we must gain a clear understanding of the role of coal-dressing in the modern economy and analyze the situation from the long-term strategic perspective in order to make the correct choice at the present crossroads.

1. All-Round Development of Coal-Dressing Is a Necessary Choice for the Coal Industry

1.1. Coal-Dressing and Energy Conservation

As everyone knows, about three-fourths of China's energy comes from coal. For many years, owing to low coal prices, coal combustion technology and equipment were outmoded; numerous factors, such as poor coal quality and a product assortment that was not geared to purchasers' needs, resulted in low efficiency of coal utilization. Assuming an annual coal consumption of 1 billion tons, an increase of only 1 percent in energy utilization efficiency would save 10 million tons of coal: this indicates the potential for energy conservation. As an example, in the first half of 1993, the ash content of the high-quality metallurgical coal that the East China Coal Company supplied to the Angang and Bengang steel works decreased by 0.5 percent, with the result that the two plants decreased their consumption of high-quality coal by 300,000 tons. The fountainhead of energy conservation is the adoption of coal-washing and dressing by the coal mines in order to provide their customers with a superior-quality product variety that meets their needs.

1.2. Coal-Dressing and Saving of Transport Resources

On a national scale, China's coal resources flow from northwest to southeast. From the viewpoint of Northeast China, coal shipment is from north to south. The result is that coal takes up 40 percent of total railroad haulage. Railway capacity has already become a bottleneck that seriously constrains coal production and coal delivery. If local coal-dressing in the mining regions removes extraneous material equal to 10 percent of the amount of raw coal, this would free up 4 percent of total rail haulage capacity, producing significant benefits.

1.3. Coal-Dressing and the Environment

Combustion of large amounts of coal is the main source of urban air pollution in China. The environmental departments found that in 1989, coal combustion nationwide resulted in the emission of 13.60 million tons of flue dust

and 14.80 million tons of sulfur dioxide into the atmosphere. In the southwest, where high-sulfur coal is used, acid rain is already occurring. The way to improve environmental quality is to use clean coal and to modernize coal use technology. Attaining the objective of clean coal depends on the gradual adoption of coal-dressing.

1.4. Coal-Dressing and the Coal Mine Economy

Under the planned-economy model, many state-owned coal mines depended on state subsidies to survive. But now the coal mines must survive amid market competition. Coal-dressing not only results in superior quality, but also yields significant economic benefits. According to East China Coal Company statistics for 1992, the average profit per ton of raw coal after dressing is 23.50 yuan for coking coal and 14.90 yuan for power coal. Clearly, expanding the use of coal-dressing is one way for the coal mines to escape their current difficulties.

1.5. Coal-Dressing and Coal Mine Modernization

In the fierce competition of the market, coal mines must make great efforts to increase labor productivity and decrease production costs, and in addition they must introduce mechanization, automation, and larger-scale processes. With a high degree of mechanization, assuring the quality of coal products depends primarily on washing. For example, in England, Germany, France, Australia, Canada and Japan, 90 to 100 percent of all raw coal is sent for dressing; and even in the United States, where the coal strata occur under excellent geological conditions, fully half of all raw coal is subjected to washing and dressing. The ash content of high-quality coking coal in these coal-producing countries is 7 to 8 percent or less, and the anthracite supplied to power plants has a caloric content of at least 25 megajoules per kilogram. The quality requirements for household-use coal that is put on the market are even higher. Clearly, the coal-producing countries in which the market mechanism drives development devote great effort to coal-dressing. This approach should also be adopted in China's coal-mine modernization effort.

1.6. The Coal Mines' Choice

We are now in the period of transition from a planned economy to a market economy. The market mechanism is still imperfect and coal users' consumer psychology is still immature, so that temporary difficulties are inevitable. For example, under the former technology policy, power plants were routinely designed to burn coal of low caloric value and regularly used cheap raw coal or low-quality coal. This approach is still being followed in the design of new power plants, which is the principal factor hindering the acceptance of superior-quality washed coal products by power plant managers. But burning low-quality coal in power plants is uneconomical and pollutes the environment; technological progress and increasingly stringent environmental requirements are sure to make the electric power industry adopt more rigorous requirements regarding coal quality.

To summarize, coal mines must educate their customers, develop markets, and take the long view in developing their product-quality strategy. The core of this strategy is the all-round development of coal-dressing, so that the mines can offer superior-quality coal and a product assortment

that meets consumer needs in order to gain the initiative on the market. This is the choice that China's coal mines must make as they enter the market.

2. The Technological Approach to All-Round Development of Coal-Dressing

2.1. All-Round Development of Coal-Dressing

The concept of "guaranteeing washed coal to the iron and steel industry" that took shape in the 1950s is still influencing the overall development of coal-dressing in China. While supplying the iron and steel industry with high-quality coking coal is certainly a responsibility of the coal mines, this demand represents less than 7 percent of total coal sales; the market for varieties other than coking coal is much broader. The idea of the all-round development of coal-dressing is intended to correct outmoded conceptions. It means that: (1) coal mines must orient themselves to all types of users and serve all users; (2) washing and dressing must not be confined to coking coal; (3) the state-owned major coal mines must have coal-dressing plants, and local medium-sized and small coal mines, too, must develop coal-dressing capabilities.

2.2. Establish Flow Sheets That Are Flexible and Responsive

Coal-dressing flow sheets should focus on efficiency, quality, simplicity and flexibility. Efficiency means a high classification efficiency, high work efficiency, and advanced performance indicators; quality means the ability to guarantee product quality across the board and to implement a closed washwater cycle; and efforts must be made to make processes simple and to keep the flow sheets easy to adjust.

Demand is constantly changing on the coal market: coking coal sometimes must be sold for power production; lump coal sometimes sells well, and sometimes powdered coal is in special demand. In order to adapt to market changes, flexible, adjustable flow sheets suited to a variety of conditions must be created, assuring responsiveness and the ability to change the product assortment at any time.

To stabilize product quality and obtain superior classification results, raw coal mixing must be adopted.

In order to guarantee the supply of coking coal, a flow chart that uses dense-medium classification, either alone or in combination with jigging, followed by flotation of fine coal, must be developed. Pressureless-feed dense-medium classification cyclones for particle sizes of less than 50mm are already in use and should be adopted more widely where appropriate.

The washing and dressing of power coal must be geared to the quality characteristics of the raw coal and to market requirements, using a simple, flexible flow sheet. If the raw coal is of small particle size and the content of extraneous matter is relatively low, then washing can be restricted to lump coal with a particle size of 13 (or 6)mm and larger; but when the raw coal has a high ash content, all particle-size fractions must be sent for washing.

Hydraulic-drive moving-screen jigging machines developed in recent years have raised the upper limit on the piece size in this process to 300 or 400mm. These devices have high throughput, high sorting efficiency, and extremely low water

consumption, and thus are ideal equipment for removing refuse from lump coal. The model TD14/2.8 moving-screen jigging machine, with a surface area of 2.8 square meters, is already being used successfully at the Longfeng Coal-Dressing Plant, under the Fushun Mining Office. It has been evaluated and approved at the ministry level. Production-scale tests show that the processing capacity is 50 tons per square meter per hour, with an imperfection rate (I) of 0.053 to 0.071. The efficiency is 98.6 to 94.5 percent. The amount of cycle water required is 0.08 cubic meters per ton. The moving-screen jigging machine can be used as the basis of simple process flow sheets. For example, power-coal-dressing plants can use it to replace hand picking and dense-medium sorting machines in the processing of the 300-50 (25)mm fraction of lump coal. It is also possible to set up a coal washing flow sheet that separates the 300-50mm and 50-13mm fractions, thus extending the washing process down to a particle size of 13mm. In coking coal production, the jigging machine can be used for preliminary removal of refuse from large lump coal. It can also be used as a simple means of mechanizing refuse removal in the many screening plants now in operation. Broad adoption of the moving-screen jigging method will make it possible to realize significant economic benefits with a relatively small expenditure and to achieve a marked improvement in product quality.

3. Developing High-Efficiency Technologies and Equipment and Raising the Level of Automation

The principal respects in which China's coal-dressing industry lags behind those of the developed countries are: (1) only a small fraction of all coal is dressed; (2) product quality is low; (3) equipment is primitive; (4) the degree of automation is low; (5) labor productivity is very low. In order to narrow the gap, we must provide coal-dressing plants with efficient, reliable, energy-saving, large-scale technologies and equipment and disseminate automation techniques.

Many new types of coal-dressing equipment have been appearing in China over the past few years. Classification equipment includes the SKT series of jigging machines, the TD14/2.8 moving-screen jigging machine, three-product cyclones, pressureless-feed cyclones, rotating-tube spiral separators, and large-dimension flotation equipment. Dewatering equipment includes 500-, 800-, and 1050-cubic-meter box-type pressure filters, the WLC series of sedimentation and filtering centrifuges, large vacuum filters, the TLL series of scraper-feed centrifuges, and high efficiency concentrators. Crushing and screening equipment includes four-roller breakers with toothed rollers, equal-thickness screens, wire screens, probability screens, high-frequency vibrating screens, and spiral screens. When these new types of equipment are disseminated, they should lead to the development of new facilities that are on a larger scale, with higher efficiency, greater reliability, and greater energy conservation. The needs of medium- and small-size dressing plants and simple dressing plants must also be taken into consideration.

Since automation systems went into operation at the Lao-hutai dressing plant, Fushun Mining District, in 1988, more than 30 coal-dressing plants nationwide have adopted programmable equipment for integrated control and for automated monitoring of certain production processes. This

indicates that the use of computers in integrated equipment control is maturing. All new large- and medium-size coal power plants should incorporate these capabilities, and older plants should modernize where conditions permit. Process automation should be adopted by coal-dressing plants where possible; it should involve improvement and upgrading based on existing experience.

Increasing the scale and reliability of equipment and increasing the degree of automation will pave the way for high-efficiency coal-dressing plants.

4. Expansion of Markets, Policy Support

Under the programs of the relevant departments, by the year 2000, China's coal-dressing capacity is scheduled to reach 420 to 500 million tons per year, more than twice the current capacity, and as a result, the percentage of raw coal that is sent for dressing is to reach 30 percent. This task is clearly an arduous one.

A commodity economy is different from a product economy in that the producers must promote their own products and actively participate in market competition. When coal is put on the market as a commodity, initiative must be taken in opening up markets. Especially at present, when the market mechanism is not yet fully efficient and the users' consumer psychology has not fully matured, coal mines must redouble their efforts to make the users aware of their products and to open up markets for dressed coal products. When the coal market reaches maturity, the markets will have a feedback effect on coal producers, thus promoting the development of coal-dressing. Only when this beneficial cycle is established will it become possible to institute all-round development of coal-dressing.

Even more than efforts by the coal mines themselves, policy support is essential for the all-round development of coal-dressing. Only with policy guidance and macroscopic adjustment is it possible to bring about a situation in which the users accept dressed coal products and in which the coal market can develop effectively. We suggest that the government create or improve relevant laws on coal, commodity quality, environmental protection, rail transport, and the like. It is advisable to specify the maximum amounts of pollutants in each unit of coal produced for combustion and to stipulate that low-quality raw coal must be processed locally, that low-caloric-value coal may not be hauled over long distances, and so on.

Since the state was founded, China's coal industry has consistently based its accounting procedures on raw coal. With advancing enterprise reform, the state no longer uses raw coal output as an evaluation indicator for coal enterprises; but coal mines still use it as the basis for calculating many economic and technical indicators. The result is that the mines still have an incentive to maximize raw coal output. Once coal is made a market commodity, the time should be ripe for changing the accounting basis to commodity coal and for using profits and losses as the evaluation indicators for coal enterprises. We suggest that leadership organizations lose no time in changing the coal accounting system and in bringing it into line with international practice.

Oil, Gas

Joint Exploration Underway To Exploit Offshore Oil

40100040A Beijing CHINA DAILY (Business Weekly)
in English 7 Mar 94 p 1

[Article by Chang Weimin: "Joint Move Under Way To Exploit Offshore Oil"]

[Text] Sino-foreign joint exploration for petroleum in the East China Sea was kicked off last week, signalling a strategic move for East China's economy and the future of China's offshore oil operations.

The long-awaited exploration started with initial seismic work commissioned by a foreign oil consortium. At the same time, dozens of technical firms have arrived to help establish a service centre in Wenzhou, Zhejiang Province.

Oil and gas reserves in the region are expected to ease the decades of energy shortages in East China's five provinces and the economic giant of Shanghai.

Estimates say some 4.6 billion tons of crude oil and 2,480 billion cubic metres of natural gas are contained in the sea. Combined, they are equivalent to 6.5 billion tons of crude oil.

The exploration, expected to span seven to eight years, will be carried out by oil firms such as the American-based Exxon, Texaco and Chevron; the Italian Agip; and the Netherlands' Royal Dutch Shell.

Reserves verified so far in China's offshore areas ensure that annual production of oil will increase from last year's 4.6 million tons to 12 million tons within four years, and continue at 8 million tons thereafter. However, future development will depend on the size of future discoveries.

On Tuesday, an engineering vessel began seismic work in a block awarded to a consortium consisting of Texaco, Agip and the Danish firm Maersk.

It is the first prospecting move by a foreign oil group there.

As the first winning team in an international bidding conducted by the China National Offshore Oil Corporation (CNOOC), the three foreign firms were awarded three offshore blocks, 400 kilometres southeast of Shanghai.

Also on Saturday, some 20 Chinese and foreign technical firms moved into Wenzhou, a service centre for oil operations in the area.

The firms will provide technical services for the project. Engineering vessels also are to be hauled to nearby ports and heavy equipment will be installed at the bases for future use.

Other foreign oil firms that won bids are to kick off seismic work in the sea later this month or the next. A CNOOC official said seismic work is likely to begin in all contract blocks within the next two months.

The bidding for exploring the East China Sea, announced in 1992, ended in January this year with 18 contracts and agreements signed with 17 firms from seven countries.

The bidding was for 72,800 square kilometres, divided into 20 blocks. All but two of the blocks—7,800 square kilometres—were snapped up.

Chen, CNOOC's vice-president, last week called the international bidding a success. "The results are better than expected," he said.

In the fourth quarter of this year, the Texaco-led group and another group consisting of Japan Petroleum Exploration Co. (Japex) and Teikoku Oil Co. are likely to drill test wells. The two Japanese firms were awarded two blocks.

According to contracts, foreign oil firms will conduct 20,000 kilometres of seismic lines and drill 50 test wells in the sea. They expect to use \$300 million to finance the exploration.

He attributed the success partly to Chinese offshore oil firms' good reputations.

To date, CNOOC has signed 94 contracts and agreements with 55 firms from 15 countries. Some \$3.4 billion in overseas funds have been used for oil operations in the South China Sea and the Bohai Sea.

Chen said China did not open the sea until 1993 because more work was needed to avoid disputes over the China-Japan ocean boundary, unsettled in some places.

Chen did not elaborate on that diplomatic matter, but said CNOOC had successfully handled related issues and could ensure implementation of the bidding.

The saying is untrue that China had been reluctant to open the sea to foreign oil firms because that site is the country's most petroleum-rich offshore area, Chen said.

China opened the South China Sea and the Bohai Sea in the early 1980s.

China, during explorations of the sea before the international bidding began, had conducted 120,000 kilometres of seismic lines and drilled 28 wells there.

Amoco Seeks Investment Opportunities in China

40100043A Beijing CHINA DAILY (Economics)
in English 19 Mar 94 p 2

[Article by Chang Weimin: "Amoco Seeks Opportunities for Investment in China"]

[Text] The Chicago-based Amoco Corporation, one of the world's largest oil firms, is seeking opportunities for substantial investment in China.

Lawrason D. Thomas, Amoco vice chairman, said in Beijing yesterday that his firm expects to shoulder "a good portion" of the \$300 billion investment that Amoco estimates China will need for its energy sector by the year 2000.

Thomas made the estimate at the China Petroleum Investment Conference that ended yesterday.

He said Amoco plans to participate in onshore and offshore oil exploration, gas distribution, the development of coal bed methane, the expansion and renovation of oil refineries and petrochemical manufacturing in China.

"We expect to be a big partner of the Chinese," Thomas said.

Amoco, which began operations in China in 1976, is now developing a \$650-million oilfield in the South China Sea that will be put into production in 1996.

The oilfield, called Liuhua 11-1, will produce 60,000 barrels per day, or 3 million tons a year.

At a press conference on Thursday, Thomas said his firm will concentrate its expansion in China, Mexico and Russia.

Amoco, which is exploring for oil in Fuyang, Anhui Province, has registered in China's second round of bidding for 26 onshore blocks in North China.

"We've read all geological materials prepared for us and are now technically evaluating the basins for bidding," Thomas said.

C. Patrick Chu, president of the Amoco Orient Company, said Amoco will launch a chemical manufacturing joint venture in Zhuhai.

Chu said Chinese Government approval for the venture is expected to come in the second quarter of this year.

The venture, if approved, will boost Amoco's investment in China to \$1.1 billion, according to Chu.

Amoco, which has a 50 percent stake in Yizheng Amoco Fabrics Company in Jiangsu Province, is also negotiating with China Petrochemical Corporation for several new joint ventures.

Thomas believes China's dynamic economic growth will create substantial needs for energy in the future.

During his keynote speech at the China Petroleum Investment Conference, Thomas said Amoco supports governmental policies that would ensure China's continued growth.

"We at Amoco strongly support the position that China should be made part of the GATT (General Agreements on Tariffs and Trade) process without further delay," Thomas said.

"In addition, we have repeatedly urged the United States Government to renew China's most-favored-nation trading status in the near future to ensure a smooth continuation of trade and investment ties between the two countries," he said.

BP, Japanese To Begin Seismic Tests in Tarim

40100045A Beijing CHINA DAILY (Investment and Trade) in English 28 Mar 94 p 2

[Text] British Petroleum and four Japanese partners announced last week that they have signed an agreement with China National Petroleum Corp to explore for oil in the Tarim Basin in Xinjiang Uygur Autonomous Region. Under the agreement, the BP group can begin seismic testing next month in a 14,475-square-kilometre block and continue for three years. BP Exploration has a 55 percent interest in the project, while Nippon Oil Exploration Co controls 15 percent and Itochu Oil Exploration, Mitsubishi Corp and Mitsui & Co each hold 10 percent.

1993 Oil, Natural Gas Production Exceed State Plan

946B0046A Beijing RENMIN RIBAO in Chinese
15 Jan 94 p 2

[Article by reporter Fei Weiwei [6316 0251 0251]]

[Text] China's onshore oil industry is maintaining its growth momentum despite growing obstacles to prospecting and development, pressure for replacement resources, and shortages in construction funding. Oil and natural gas

production in 1993 both exceeded the State plan; crude oil output was 139.2 million tons, 1.04 million tons over the previous year, the biggest annual increase in many years, and natural gas output was 15.4 billion cubic meters, 200 million cubic meters over the previous year. These figures were 101.2 percent and 101.3 percent of the State plan, respectively.

Development problems continue at eastern oil fields where more than 79 percent have water-content problems and annual production fell about 21 million tons. The China National Petroleum and Natural Gas Corporation is using more advanced technology, and giving more attention to proper controls on water injection extraction, and using every means to reduce the rate of comprehensive and natural depletion; while simultaneously enforcing thorough regulations, adjusting the contract policy for the final three years of the "Eighth 5-Year Plan," and carrying out reforms to spur production and development.

Since last year, various oil fields, through the pressure of reforms, have overcome difficulties and increased their oil output. Eastern oil fields are actively implementing the "stabilize oil and control water" system. Daqing oil field produced 55.9 million tons of crude oil last year, 244,000 tons more than the previous year, and has kept its production level at the 50 million ton level or above for 18 years now. Western oil fields, hampered by transportation difficulties, still produced 1.739 million more tons of crude oil than the previous year.

China's onshore oil industry's prospecting and development activities continued to grow in 1993. Confirmed oil and gas reserves were 122 percent and 244 percent of the State plan and are showing excellent reserve strength.

Erlan Tops 1 Million Tons for Third Consecutive Year

946B0046B Beijing RENMIN RIBAO in Chinese
3 Jan 94 p 1

[Article by Han Yuantao [7281 0337 3447]]

[Text] Erlan oil field, winner of the "Seventh 5-Year Plan" award for excellent engineering, had produced a cumulative total of 4.36 million tons of oil by the end of 1993, returning 601 million yuan in national profit taxes, and it has maintained an annual output of 1 million tons for three years.

Erlan oil field is located on the Xilin Gol plain where there are 70 frost-free days and seven months of hard freeze and the permafrost layer is 3.2 meters down, which makes living conditions there very difficult. The Erlan Petroleum Prospecting and Development Corporation, which is in charge of development and management, is a no-frills "Daqing minded" operation that gets the job done. Over 3,000 workers, overcoming production and technical problems, have made the oil field into a steady producer year after year. In 1993 especially, imbued with the spirit of the 14th National Party Congress, they explored Saihantala, Eren Nur, Jiergalangtu, and Wuliyasitai, expanding the area of exploration, and also surpassed the State mission by producing 1.01 million tons of crude oil.

By the end of 1993, four combined oil production stations, four collection and transfer stations, 58 computerized stations, and 820 water-oil wells had been constructed, accessory production and living facilities are improving daily, and the 361-kilometer oil pipeline routinely transports crude oil to Saihantala in Inner Mongolia.

Mianyang Develops LNG Vehicle

946B0046C Chengdu SICHUAN RIBAO in Chinese
3 Jan 94 p 1

[Article by He Wang [0149 3769]]

[Text] A unit of the Mianyang Gas Group Corporation, working with the CAS Beijing Keyang Gas Liquefaction Technology Joint Corporation and the Qinghua University Gas Vehicle Engineering Department, has successfully researched and manufactured a liquefied natural gas automobile.

At the Technical Evaluation Conference held by the State S&T Commission on 17 December 1993, experts agreed that the use of liquefied natural gas to fuel an automobile opens up new vistas for China's automobile fuels. This top-flight research and advanced technology has been achieved for the first time in China, and the tests and various functional survey data indicate that its high speed and high acceleration performance is comparable to that of gasoline, and it can take its place among the world's advanced technologies.

Breakthrough in Northern Shaanxi Oil and Gas Development

946B0052A Xian SHAANXI RIBAO in Chinese
16 Jan 94 p 1

[Article by Wang Baishun [3769 4102 7311] and He Tao [6320 7269]]

[Text] Last year, great strides were made in oil and gas exploration and development in northern Shaanxi, where 1.18 million tons of crude oil were produced—a 10.5 percent increase over the previous year—and 134.3 billion cubic meters of natural gas reserves were confirmed, placing it in the ranks of the world's major gas fields.

After crude oil production broke the 1-million-ton-mark in 1992, the Changqing Petroleum Prospecting Bureau's No. 1 oil extraction plant and the Yanchang Oil Well Administrative Bureau continued to pick up the pace of prospecting and development. The Changqing No. 1 oil extraction plant, using water injection methods, drilled multiple wells, perfected fracturing methods, and raised crude oil output to 600,000 tons, a 13 percent increase over 1992. The Yanchang Oil Well Administrative Bureau converted old well technology for shallow excavation, got nine county and city drilling and excavation companies into drilling and oil extraction, and boosted crude oil output to 586,000 tons, a 10.7 percent increase over 1992.

Gains were also made in natural gas exploration. In a 3,200-square-kilometer area of the central Shaanxi-Gansu-Ningxia Basin, China's largest onshore gas field to date was confirmed. Evidence of an oil-bearing area of several hundred kilometers was found by 13 wells drilled in the Naner segment. Industrial-grade gas flows were found in the northern segment, confirming a gas field spreading

northward over an area of more than 1,000 square kilometers. New discoveries have been made on the western edge and beyond, forecasting excellent development prospects there as well.

Gansu Field Tops 1 Million Tons in '93

946B0052B Lanzhou GANSU RIBAO in Chinese
21 Jan 94 p 1

[Article by Di Guanglong [4574 1639 7893]]

[Text] Crude oil production at Longdong oil field broke the 1-million-ton mark for the first time last year, making up more than half of the total oil production by Changqing oil field.

Longdong oil field, run by the Changqing No. 2 oil extraction plant, lies within the boundaries of Qingyang, Huachi, and Huaixian counties. In recent years, the oil field was fading because of production difficulties. Changqing oil field and the No. 2 oil extraction plant adopted measures to stabilize and increase production. The old oil field came under combined control last year, and a production capability of 110,000 tons was established in the Wuling and Yuancheng areas last year, and the output capability for that year increased over 460 tons. Over 280 shallow extraction measures were implemented at the old oil field, and production from the shallow extraction area grew to 80,000 tons. Changes in fracturing methods at the Ling 116-2 well converted the well from a two-ton per day output to a gusher producing over 160 tons per day, which has now settled down to a steady 40 tons and more per day.

To correct the hapless situation in the oil district, local enterprises were united and illegal elements were eradicated. The No. 2 oil extraction plant signed an oil field management and protection agreement with the three counties at Longdong, and changed the external environment of the oil field, increasing crude oil output which is now up to nearly 400 tons per day.

Status, Outlook for Gasoline for Vehicular Use

946B0054A Beijing ZHONGGUO NENGYUAN [ENERGY OF CHINA] in Chinese No 12, 25 Dec 93 pp 13-18

[Article by Bian Aihua [0593 1947 5478], Academy of Petrochemical Industries]

[Excerpt]

Introduction

There are now over 500 million motor vehicles in the world, over 400 million passenger vehicles, and they consume more than 700 million tons of gasoline, of which about 40 percent is high-grade gasoline, and about 80 percent of that is unleaded gasoline. The world's automobile industries are highly competitive and they are developing rapidly. Because environmental requirements are getting stricter every day and restrictions on automobile emissions are more stringent; and because the growth of automobile industries and air-quality requirements keep going up, new demands are being put on the quality of gasoline. In the 1990s, gasoline for vehicular use will be facing new challenges.

Gasoline for vehicular use is China's second largest fuel item. China's automobile and refining industries are

growing constantly, and China has become a major producer and consumer of gasoline. In 1992, China processed 120 million tons of crude oil, produced 25.75 million tons of gasoline for vehicular use, and consumed 23.31 million tons domestically. The production of gasoline for vehicular use has grown steadily in China in recent years, and the proportion of gasoline of 90RON or higher (research octane number) is climbing steadily. As the domestic production of high-compression-ratio vehicles and 90RON and above fuel goes up, the consumption structure for vehicle-use gasoline also changes.

Strict environmental requirements pushes gasoline quality up constantly. Entering the 1990s, the U.S. set the standards for promotion of oxygen-content fuels and new formula gasolines, which will have a profound effect on the world's production of gasoline for vehicular use, and likely will present a stiff challenge to China's production of gasoline for vehicular use as well.

5. Consumption of Gasoline For Vehicular Use in China

1. Consumer Market Volumes

The world production of gasoline inevitably influences the production of gasoline in China. Petroleum developments—increases in production volumes and in quality—depend mainly on the requirements of the developing automobile industry and the capability of the refining industry. To develop gasoline for vehicular consumption, the China National Petroleum Corporation proposed a target for higher grades of gasoline in the "Seventh 5-Year Plan," which, for a variety of reasons, was not reached. In 1990, the Petroleum Corporation's development outline for the "Eighth 5-Year Plan" proposed a new target for upgrading gasoline.

In its development outline for the "Eighth 5-Year Plan," the Petroleum Corporation seeks to raise the ratio of gasolines of 90RON or more to about 90 percent of the total gasoline output, and to greatly increase the proportion of unleaded gasoline, and basically upgrade gasoline standards.

Proceeding from China's present level of capability in refining and automobile manufacture, the total gasoline upgrade is being implemented in two stages: The first stage, up to 1993, was to raise the amount of gasoline of 90RON or higher up to 70 percent of the total volume produced, to make it available in most areas, and starting in 1992, to undertake the manufacture of new types of high-compression-ratio vehicles and to convert older types of vehicles. In the second stage, from 1993 to 1995, the proportion of gasoline of 90RON or higher would be raised to 90 percent of the total volume.

Through comparative analysis it was judged that this schedule could push vehicle factories into early production of high-compression-ratio vehicles, and to convert or phase out older types of vehicles at the same time.

To speed up the development of the refining and automobile industries, the China National Petrochemical Corporation and China Automobile Industry Corporation set up a cooperative committee on automobiles and fuels for vehicular use. After discussions and consultations, the committee members agreed in principle to use the schedule above. In February 1992, the China Petroleum Corporation and

China Vehicle Industry Corporation jointly notified the various refining enterprises, petroleum sales corporations, and automobile authorities and manufacturers of their decision to implement the schedule for converting factories to the production of high-compression ratio vehicles and expand the use of 90RON gasoline. The Petrochemical Corporation is deeply committed to reaching the gasoline upgrade target.

2. China's Gasoline Production Plan For the Year 2000

The Petrochemical Corporation produces nearly 90 percent of the gasoline produced in China and its progress in the production of gasoline pretty much represents the progress of gasoline production for all of China. The Corporation has 49 catalytic cracking refineries with a capacity of 39.78 million tons; 24 catalytic reforming facilities, 23 of which produce gasoline components with a capacity of 4.43 million tons. There are 19 alkylate facilities with a capacity of 1.15 million tons, eight MTBE facilities for a capability of 150,000 tons. In the "Eighth 5-Year Plan," the Petrochemical Corporation invested several billion yuan, and continues to build catalytic reforming, alkylate, MTBE facilities and improve storage and transport installations. As the programmed high-octane gasoline production facilities come on line, there will be an increase in high-octane component fuels, and low-octane fuels will be greatly reduced, and by the end of the "Eighth 5-Year Plan" it is estimated that the national gasoline production could increase to about 30 million tons, of which about 27 million tons could come out of the Petrochemical Corporation system, over 80 percent of which would be 90RON gasoline and gasolines of 93RON and up would be about 10 percent. In the past, China's gross value of industrial output increased on an average of 6 percent per year, national economic growth was 1 percent, and the demand for petroleum products increased .7 percent. In the "Eighth 5-Year Plan," the annual economic growth rate will accelerate to 8 percent, and increased demand for petroleum products is assured. In 1992, the domestic consumption of gasoline for vehicular use was 23.31 million tons, which is expected to increase to about 30 million tons in 1995, and that could increase to over 40 million tons by 2000. As refining technology improves and domestic high-performance vehicles and environmental requirements increase, it is foreseen that by 2000 the following changes in the quality of gasoline for vehicle use will take place in China:

All gasoline for vehicle use in China will be 90RON or above, basically all of it will be unleaded, and the ratio of fine-grade gasoline could be over 10 percent. Many areas will be able to use oxygen-enhanced fuels.

With further development in the automobile industry, the average octane level of Chinese gasoline will increase by 6 to 8 RON.

Vapor-tension, unwanted hydrocarbons and benzene content will be held to suitable levels.

The rare hydrocarbon content of finished gasolines will be reduced to 20 percent or less of present volume levels.

Strict vehicle emission controls will stimulate the development of quality gasolines, future Chinese gasoline components will be greatly changed from those of the present: straight-run gasoline with low octane content will be phased

out and no longer added to other gasoline: although catalytic cracking gasoline will still be a primary blending component, because of the increase in high-octane components in other gasolines, its use as a blending ingredient will be reduced; the ratio of catalytic reform gas in blends will gradually increase, but undesirable hydrocarbons will not exceed 25 percent by volume; the ratio of octane-enhanced gasoline and MTBE in gasoline blends will increase.

By 2000, the variety and quality of China's gasoline products will basically satisfy domestic market needs.

Industry Offers 1994 Stable Production Plan

946B0058A Beijing RENMIN RIBAO in Chinese
21 Jan 94 p 2

[Article by reporter Zhang Chaowen [1728 6389 2429]]

[Text] On 20 January in Beijing, President of the China National Petroleum and Natural Gas Corporation, Wang Tao, said China's petroleum industry will fulfill its 1995 crude oil production goal as stipulated in the "Eighth 5-Year Plan" one year ahead of schedule, and will strive to reach entirely new levels of oil prospecting and development.

Wang Tao said this year's national onshore crude oil production plan is 138.5 million tons, and natural gas is 15.4 billion cubic meters. The China National Petroleum and Natural Gas Corporation's own target is 140 million tons and 16 billion cubic meters, and it will try to get into the next 5-year plan ahead of schedule. The current annual crude oil production and processing and petroleum product consumption volumes for eastern China are about 90 percent of that for the whole country. Petroleum businesses have decided to beef up their efforts in the east, in the Songliao Basin, the Bohai coastal waters, and some of the old oil fields, organizing domestic and foreign forces to venture into prospecting so that this year and the next there will be new increases in exploitable reserves over a fairly wide area. Production will be stable at 124 million tons, and that should be increased somewhat. In the west, the petroleum industry will accelerate the pace of exploration by focusing on Tarim, Junggar, and Turpan-Hami. In 1994-95, the petroleum industry will be concentrating on the Central Tarim area, which takes on the structure zones with evidence of oil at Junggar and on the Shengbei area of Turpan-Hami. The petroleum industry will concentrate on exploitation in these areas and control the reserves, and also develop high-efficiency oil fields according to industry plans. A crude oil production capability of 6 million tons in the three major basins is being established and efforts are being made to improve rail transportation, which will help to realize a big increase in production of crude oil.

Preparation Work Proceeds on Largest Offshore Gas Field

946B0057B Beijing RENMIN RIBAO OVERSEAS
EDITION in Chinese 16 Feb 94 p 2

[Article by Chang Sheng [1603 4141] Wei Xuan [4850 6693] and Cheng Gong [2052 0501]]

[Text] Preparation work on the largest offshore gas field in China, the Ya 13-1 gas field, is moving ahead smoothly, and could be finished and in operation by 1 January 1996, routinely sending gas to Hong Kong and Hainan. By 30

January, the Sino-foreign cooperative "(Ximake No. 1)" pipeline-laying ship has laid down over 240 kilometers of pipeline, one-fourth of the total length of the pipeline.

Confirmed natural gas reserves at Ya 13-1 are up to 100 billion cubic meters. One of the two submarine gas pipelines will be 14 inches in diameter and 91 kilometers long and will lead to Hainan island; the other is 28 inches in diameter, 778 kilometers long and will go to Hong Kong, of which 707 kilometers of the underwater construction work is being done by the Italian (Shipeng) Offshore Petroleum Engineering Corporation and the European Offshore Petroleum Engineering Corporation, Ltd. Over 300 technical personnel from the UK, the Netherlands, Norway and China arrived at the worksite at the end of last year. The "Ximake No. 1," a third-generation semi-submersible pipeline-laying vessel, is one of only a few fast pipe-laying vessels in the world equipped with a dual-pipe handling station, and since it started working, it has laid an average of 4.164 kilometers of pipeline per day. At this rate, it is expected that this main pipeline will be completed before 8 June of this year.

Agreement With Italy, France on Southeastern Tarim Oil

946B0057C Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 9 Feb 94 p 1

[Article by reporter Qin Jingwu [4440 0079 0582]]

[Text] On 9 February in Beijing, the China National Petroleum and Natural Gas Corporation signed contracts to cooperate for oil in the first section of southeastern Tarim Basin with the Italian Agip (Overseas) Corporation, the French ELF Petroleum Corporation, Japan Energy Resources, Japan Oil Development Company, and the U.S. Texaco China Corporation.

The first section is a part of the area of southeastern Tarim open to foreign cooperation located inside the territory of Hotan in the Xinjiang Uygur Autonomous Region covering an area of 9,814.3 square kilometers.

The contracts stipulate that during the eight-year prospecting period, the foreign parties will bear all prospecting expenses and risks, and when oil and gas fields are discovered both sides will join in development and production, and will take proportionate shares of the crude oil produced as stipulated in the contracts.

The China National Petroleum and Natural Gas Corporation will buy the foreign shares of oil with U.S. dollars according to the international market value to allay foreign misgivings about transporting the crude oil out of the area, a concession made to encourage outside interests in the development of Tarim Basin.

Seven Countries In On East China Sea Bidding

946B0060A Hangzhou ZHEJIANG RIBAO in Chinese 5 Jan 94 p 1

[Article by correspondents Yu Man [0151 2581] and Feng Jinhai [7458 6855 3189]]

[Text] The fourth round of bidding for Chinese offshore oil, opening up the coastal areas of the East China Sea for cooperative exploration and development, came to a close after one and one-half years. Nine groups organized from 15

petroleum corporations from the U.S., Japan, the UK, the Netherlands, Italy, Denmark, and Korea secured bids, and signed 18 petroleum contracts and agreements. Among them were well-known oil corporations such as Texaco, Chevron, Exxon, and Shell. Foreign oil corporations will invest US\$300 million at their own risk during the exploration period. Considering the world economic depression, weak oil prices, and oil corporation belt-tightening on exploration expenses, the invitation for foreign bidding was a huge success.

On 30 June 1992, with permission of the Chinese Government, the China National Offshore Oil Corporation issued the call for a fourth round of bidding for offshore oil.

The near-offshore region of the East China Sea open to foreign bids is divided into two sectors, north and south. The northern sector is located east of the mouth of the Chang Jiang and is further divided into four segments open to separate bidding. The southern sector is near Zhejiang shores, the center of which is located about 100 to 150 kilometers from Wenzhou, and it is divided into 16 bidding segments. Chinese and foreign petroleum geologists estimate that this area holds about 2 to 4 billion tons of oil and gas resources, and it is one of the most promising prospecting areas on the eastern continental shelf. The bidding areas will be supported by the most economically developed area on the east coast of China, and the eastern sea oil and gas resources will not only be a great source of energy for this area, but will set the conditions for expanding the market for eastern sea oil and gas and for increased processing of petroleum.

In this round of bidding, 90 percent of the 18 areas was open to bidding and bids were awarded for 89 percent of the total area.

Now, the foreign oil corporations that won bids are going ahead with preparations, and it is expected that geophysical prospecting activities will begin in March and drilling will begin in the fourth quarter of this year.

Rich Oil and Gas Deposits in Nansha Islands

94P60179 Fuzhou FUJIAN RIBAO in Chinese 15 Feb 94 p 3

[Text] Geological exploration in China's Nansha Islands has produced new findings. The 1993 geophysical prospecting mission has been completed and the six trap structures in the Wanan basin have been appraised, bringing us a step closer to realizing the development of rich oil and gas resources. It is known that the Nansha Sea Area, a Cenozoic sedimentary basin with a whole series of thick sediments and different structures, is rich in oil and gas resources. The outlook is excellent for the five large and medium oil- and gas-bearing basins (Wanan, Zengmu, Wencai-Shaba, Bala-wang and Liyue) in the region. They cover some 290,000 square kilometers within the traditional boundaries of China. The Zhengmu Basin is a large, foreland-type Cenozoic sedimentary basin with very deep marine facies clastic sediment and carbonate sediment; average thickness is 4000 to 7000 meters with the thickest running to 11,000 meters. It has many oil and gas-formation and storage combinations. Today, foreign oil companies have discovered and developed more than 40 oil and gas fields and oil-bearing structures.

The Wanan Basin is a shear, elongated Cenozoic large/medium basin with very thick land and marine facies sediment; average thicknesses are 5000 to 7000 meters and it also has excellent oil and gas-forming and storage combinations. In physical and seismic exploration carried out from 1991 to 1992, China discovered 17 large and medium local structure traps and last year conducted a semi-detailed survey of six of these local structures, establishing an excellent basis for eventual offshore drilling operations.

Nuclear Power

S&T Resources Pooled To Develop 600MW Nuclear Power Plants

946B0045A Shanghai JIEFANG RIBAO in Chinese
5 Jan 94 p 1

[Article by Cao Yuhe [2680 3768 0735] and Wang Baoan [3769 0202 1344]]

[Text] Close to 1,000 S&T workers in Shanghai are actively engaged in the research and development of new materials and facilities for 600MW nuclear power plants. Last year, 20 major S&T target projects were completed, which, combined with the 34 projects completed in the last four years satisfies 60 percent of the total of target projects, and they have earned 570 million yuan through domestic and foreign-ordered items.

The 600MW nuclear power plant is designated to be China's standard reactor for the duration, and the second-stage project for the Qinshan nuclear power plant will be to build a 600MW nuclear power plant. Shanghai will handle most of the R&D effort for the new materials and facilities. The Shanghai Key Industrial S&T Projects Office has listed 89 research projects for development, involving such fields as electromechanics, metallurgy, chemical industry, and instruments. More than 40 scientific research institutes, schools of higher learning, factories and enterprises have secured bids, and national funding for these S&T projects has already topped 13 million yuan.

Zircaloy, the "number one metal of the nuclear age," has been successfully produced by the Shanghai Non-Ferrous Metals and Materials Institute. The indicator circuits for the magnetic coils and rods for the rod control drive mechanism for a 600MW nuclear power plant require materials with 50 percent more heat resistance than the same materials for a 300MW nuclear power plant. The research team headed up by Ling Chunhua, a senior engineer for the Shanghai Electric Cable Research Institute, has achieved success after more than three years of research.

Many of the target S&T projects are the cooperative effort of schools of higher learning, factories and enterprises. The Shanghai Instruments and Elastic Elements Plant, the Shanghai Industrial University's Applied Mathematics and Mechanics Institute, and the Corrugated Pipe Research Center cooperated in the research effort for the multi-layered stainless-steel corrugated tubing to be used on the loop valves for the plant, and as a result, this item has become an export item instead of an import item. The Shanghai Complete Power Plant Facility Research Institute assisted the Shanghai Steam Turbine Plant in making important advances in the double-layered high-pressure

pistons for the power plant turbines, and simplified the manufacture and installation of those items.

Nuclear Safety Inspection System Takes Shape

946B0057D Beijing RENMIN RIBAO OVERSEAS
EDITION in Chinese 7 Feb 94 p 1

[Article by reporters Zhou Zhifang [0719 1807 2455] and Deng Ying [6772 7336]]

[Text] On 5 February, an official of the Nuclear Safety Administration said that China's nuclear safety inspection system is beginning to take shape.

When China began developing nuclear power in the 1970s, the policy of "safety first, quality first" came into being, and in 1984 the Nuclear Safety Administration was created, establishing a legal venue for nuclear power construction and development. Throughout this time the State issued a series of nuclear safety laws and regulations: "Safety Inspection Regulations for Nuclear Engineering for Civil Use," "Regulations for Control of Nuclear Materials," and "Regulations for Nuclear Power Plants and Emergency Handling of Nuclear Accidents." These laws, regulations, and guidelines are drawn up in accordance with the nuclear safety standards of the international atomic energy organizations, and define in detail the safety standards and quality guarantees for civil-use nuclear construction and transportation.

The official said that a State safety licensing system has been put into effect. In order to have a better scientific approach to nuclear safety the Nuclear Safety Administration set up a special nuclear safety committee composed of 32 well-known specialists from various technical fields to be responsible for consultation on the evaluation, inspection, and administration of safety in civil-use nuclear engineering. A Nuclear Safety Center also set up in Beijing is responsible for technical guarantees in the administration of nuclear safety, and to undertake evaluation, inspection, monitoring, and the analysis and research of information relating to nuclear safety. Inspection stations have been set up in Shanghai, Guangdong, and Chengdu, which will be separately responsible for nuclear safety inspections in the eastern, southern, and western parts of China.

Guangdong Governor Announces Plans for Second Nuclear Power Plant

946B0058B Beijing RENMIN RIBAO OVERSEAS
EDITION in Chinese 23 Feb 94 p 1

[Article by Wang Sheng [3769 3932]]

[Text] Guangzhou, 22 Feb (XINHUA)—On 22 February, at the second plenary session of the 2nd Committee Conference of the Guangdong Provincial 8th People's Congress, the Governor of Guangdong, Zhu Senlin, announced that Guangdong will build a second nuclear power plant at Daya Bay.

Zhu Senlin said the second nuclear power plant could have four units, and a third nuclear power plant might be built at Yangjiang with four to six units. It is reported that the first stage of construction at the Daya Bay nuclear power plant has been completed. If the three nuclear power plants are built, it would raise installed capacity to 10,000MW.

In response to questions concerning nuclear power plant safety issues, Zhu Senlin said that excellent emergency measures to guarantee safety are in force in the 5- to 50-kilometer zone around the Daya Bay nuclear power plant, and there is nothing to worry about.

Alternative Energy

Taking Steps To Rapidly Develop New Energy Technology

946B0050A Chongqing XIN NENGYUAN (NEW ENERGY SOURCES) in Chinese Vol 16 No 1, 5 Jan 94 pp 1-6

[Article by Wang Changgui [3769 7022 6311] of the Institute of Energy Resources, State Planning Commission, MS received 22 Sep 93]

[Text] In view of the fact that mineral energy resources are limited and the worsening pollution problem as a result of large-scale use of fossil fuel, in order to ensure that energy can be supplied in a steady and sustained manner and to minimize and prevent the harm of pollution, all the nations in the world, particularly developed nations, are very interested in the development of new energy technology. New energy technology is considered as a supporting technology. Steps are being taken to actively develop it with substantial investment.

In China, new energy resources primarily include a variety of renewable energy resources such as solar, wind, biomass, geothermal, and ocean energy. With the support and unified planning of the Chinese Communist Party and the government, new energy technology has a relatively solid foundation. It is considerable in size and has supplied some energy to the economy resulting in conservation of fossil fuel and reduction of environmental pollution. Nevertheless, compared to future energy demand and to the worldwide level, it still lags by a large margin. New plans need to be prepared and more forceful measures ought to be taken to speed up the development of our new energy technology.

1. Development of New Energy Resources Has Major Strategic Significance

The near-term goal to develop and utilize new energy resources is to supply electricity and other forms of energy to remote, rural and border areas and to isolated islands, to deliver electricity and energy to special sites, to conserve conventional energy resources, and to reduce pollution and ecological harm. The long-range goal is to gradually optimize the energy resource structure to continuously raise the proportion of new energy resources in this structure in order to reduce the use of fossil fuel to prepare for future transition from the standpoint of technology, economics, and commercial production.

The development and utilization of new energy resources in China has the following significance.

(1) Major social and political significance. As of the end of 1992, there was no electricity in 28 counties, 1,462 villages and 63,583 hamlets. Those who have no access to electricity are 30,680,000 rural households and 120,000,000 people. Most of them are located in remote mountain areas, grazing lands, plateaus, and islands where conventional energy resources are scarce and small-scale hydropower resources

that are technoeconomically feasible are also limited. Moreover, they are far away from major power grids and are sparsely populated. There is not much demand and not readily accessible due to lack of transportation means. However, these areas have an abundance of new energy resources such as solar, wind, and biomass energy. To this end, the way to solve the power and energy supply for these regions is to develop and utilize local energy resources. If electricity is available, the economy can be improved, scientific and cultural levels can be raised, and the quality of living can be improved, free of poverty and backwardness. This has considerable significance to the balanced growth of our national economy. It also strengthens our national unity and enhances our political stability.

(2) Major energy economic significance. In recent years, due to economic growth, the demand for electric and non-electric power has surged. It further aggravates the long-existing energy shortage situation. According to our statistics, the overall power generating capacity nationwide is 151,470MW and the capacity of facilities using electricity is 367,300MW. The ratio is 1:2.42, while a more reasonable ratio is less than 2. This causes frequent power shortages that lead to plant shutdowns due to power outage. Even ordinary residential power cannot be guaranteed. It is especially difficult in rural areas. This significantly impacts and limits our economic growth and improvement of our living standard. As technology matures, equipment and power generating costs have reduced substantially. Development of photovoltaic and wind power and utilization of biomass, geothermal, and tidal energy in a planned manner can save us tremendous amounts of conventional energy equivalent to thousands of tons of standard coal. It will have an effect on alleviating the shortage of electric and non-electric power in China and make a contribution to our modernization effort.

(3) Environmental and ecological significance. Atmospheric pollution and global warming is a major environmental problem associated with energy consumption facing the world in the 1990s. Many countries are taking steps to solve this problem by actively improving efficiency and significantly upgrading the energy structure. This is the so-called energy efficiency revolution, or clean energy revolution. Presently, approximately 78 percent of the non-renewable energy consumed comes from fossil fuels such as petroleum, natural gas, and coal. The burning of fossil fuel produces CO₂ which is the primary cause of acid rain and greenhouse effect. To this end, the key to solving the global warming problem is to reduce the release of CO₂. The amount of CO₂ released by China ranks number three in the world, next only to the U.S. and Russia. In 1989, it reached 2,386.613 Mt which accounted for 10.9 percent of the amount discharged worldwide. China is the largest coal-producing and consuming nation in the world. 85 percent of CO₂ released from fossil fuel comes from coal. It accounts for 60 percent of the greenhouse gas released nationwide. There are two major approaches to reducing CO₂ discharge. One is to substantially improve the energy utilization efficiency to conserve resources. The other is to gradually alter the energy consumption structure by developing renewable energy resources, such as hydropower, solar energy, wind energy, biomass energy, geothermal energy, and ocean energy, to reduce the consumption of fossil fuel and the burning of

wood. According to data presented by the Office of Technology Assessment of the U.S. Congress, a conventional coal-burning power plant releases 304 gC (grams of carbon) for each kWh of energy generated. A solar thermal power plant with a backup natural gas-burning generator only releases 47 gC. Geothermal power releases only 2.5 gC. Photovoltaic and wind power do not release any CO₂.

Therefore, a substantial increase in utilization of new energy resources after several 5-Year Plan periods of construction can make a significant contribution to the reduction of CO₂ release in China and will play an important role in minimizing pollution and maintaining ecological balance.

2. China Has Excellent Natural Resources for the Development and Utilization of New Energy Resources

Located in the northern hemisphere, China covers a vast land mass and stretches across hot, warm and cold climate zones and has a long coastline. It has unique natural resources for the development of new energy sources.

(1) Abundant solar energy resource. According to estimates, China receives approximately 50×10^{18} kJ of solar radiation across its territory annually, equivalent to 170 billion tons of standard coal. Globally, the overall solar radiation is 335-837 kJ/(cm² a) with a median value of 586 kJ/(cm² a). From the distribution of year-round solar radiation, Xizang, Qinghai, Xinjiang, southern Neimongu, Shanxi, northern Shaanxi, Hebei, Shandong, Liaoning, western Jilin, central and southwestern Yunnan, southeastern Guangdong, southeastern Fujian, eastern and western Hainan, and southwestern Taiwan receive a great deal of solar radiation. It is especially high on the Qinghai-Xizang Plateau where the average altitude is 4000 m above sea level. The atmosphere is thin, clear, and transparent. It is located at a low latitude where the days are long. More than two-thirds of the land in China has over 2,000 hours of sunshine per year and receives more than 586 kJ/(cm² a) of solar radiation annually. The conditions for solar energy development are excellent.

(2) Rich wind energy resource. According to weather units, the wind energy density nationwide is 100 W/m². The total wind energy reserve is approximately 1.6 billion kW/a. Approximately 160 million kW/a can be exploited in the near term due to geographic and economic considerations. Particularly along the southeastern coast and on nearby islands, along the Inner Mongolia and Gansu corridor, in the northeast, northwest, northern China and parts of the Qinghai-Xizang Plateau, for more than 4000 hours per year the wind speed exceeds 3 m/s. In some areas, the average wind speed is 6-7 m/s. The annual effective wind energy density is over 200 W/m². It is well worth development and utilization.

(3) Tremendous biomass energy resource. According to statistics, more than 560 million tons of hay is produced annually. Approximately one-half is used as industrial raw material, animal feed and fertilizer. The other half is burned as fuel. Approximately 4,000,000 ha (hectares) of firewood forest has been planted. Properly harvested, approximately 110 million tons of firewood can be produced annually. In addition, there is a considerable amount of other forms of biomass such as animal waste. Nevertheless, the way this resource is used is not rational. A large amount of hay and firewood, equivalent to 250 million tons of standard coal, is

burned in a low efficiency, low energy manner for cooking. Only 2 million tons of hay, approximately 0.4 percent of the total production, is used to produce methane gas. Almost none is utilized with other technologies. Hence, the amount of biomass resource available for use with advanced technology is very large.

(4) Relatively abundant geothermal sources of great potential are widely distributed. Surveys conducted in the past 20 years showed that there are over 4,000 geothermal sites in 30 provinces, cities, and autonomous regions across the country. There are close to 90 hot geothermal fields with a temperature above 150°C. Fifty-one of them are in Xizang, 5 in western Sichuan, 28 in western Yunnan, and 6 in Taiwan. We are among the countries with the highest temperature geothermal fields in the world. Medium- and low-temperature geothermal fields below 100°C are scattered over 700 counties and cities, mostly in provinces along the east coast. In particular, geothermal resources in major cities such as Tianjin, Fuzhou, and Beijing are especially worthwhile to develop and utilize. According to surveys conducted to date, China has 321,000MW of geothermal resources. Among them, the most promising kind is the basin thermal conduction field. It accounts for 261,000MW, or 81.3 percent, of the geothermal resource known so far. Most of them are located in the oil-rich North China Basin and Songliao Basin.

(5) Abundant ocean energy resources. Our coastline is 18,000 km long. In addition, more than 6,500 islands form an additional 14,000 km of coastline. We have an abundance of ocean energy. A tidal survey completed in 1982 showed that there are 156 gulfs and bays and 33 river mouths that can accommodate a generating capacity of 500 kW or more. The total installed capacity for tidal energy is 20,980MW for an annual output of 580×10^8 kWh. We are indeed rich in tidal energy. The total power to be derived from wave energy along the coast is estimated to be 70,000MW. It is concentrated in provinces such as Zhejiang, Fujian, Guangdong, Hainan, and Taiwan. Our offshore ocean current energy reserve is estimated at 50,000-100,000MW, which is approximately one-tenth to one-twentieth of the total ocean current energy worldwide.

3. Base Exists for the Utilization of New Energy

Our government is very interested in the development and utilization of new energy resources. It has been included in the economic growth plan. An active policy has been formulated and considerable manpower, materials and funding have been invested in this area. Overall, the development of new energy resource has not been slow. After several 5-Year Plans, there is a relatively solid base. To some extent, it has been used in the field and has some effect on energy conservation and pollution reduction.

3.1 Solar Energy

In the area of solar thermal energy, approximately 140,000 solar stoves, 2 million m² of solar hot water heaters, 1.185 million m² of solar heated housing and 1 million m² of plastic-covered greenhouses were in use as of 1992. We have a solid foundation in solar hot water heating technology and the products are of good quality. In particular, our vacuum heat collector technology is at the cutting edge. Furthermore, a number of large-scale key solar hot water heater

manufacturing plants have been built. China has the largest number of solar stoves in the world. In addition, substantial progress has been made in design theory, material technology and model series. Passive solar-heated houses have a significant benefit during the winter heating season in the north, northeast, and northwest. It saves coal used for heating and reduces pollution caused by burning coal. Moreover, investment is recovered very rapidly. In the area of photovoltaics, five plants have been constructed to produce solar cells based on imported production lines. The annual production capacity is 3.5MW, 2.5MW of single crystalline silicon solar cells and 1MW of amorphous silicon solar cells. Currently, the efficiency of a single crystal silicon cell assembly has reached 12 percent and has a useful life of 20 years. The price is 40-50 yuan/W_p. By 1992, a total of 2.5MW of solar cells had been placed in applications such as railroad signals, navigation signals, microwave relay stations, satellite stations, TV relay stations, rural radio phones, and rural lighting. In particular, a 10 kW and a 20 kW photovoltaic power plant and several satellite TV reception stations were built in Ali, Xizang, at 4,500 m above sea level to provide lighting and TV reception for the people in Tibet. It also raised our photovoltaic technology to a new level. These are the largest photovoltaic stations to be independently designed and constructed in China. To date, they are the highest photovoltaic power plants in the world.

3.2 Utilization of Wind Energy

In terms of equipment development and production, the designs of 50-200 W micro wind-powered generators have been finalized and the generators are in production. The product is of high quality. It is dependable and low cost. We have the capacity to produce over 10,000 units per year. The industry is taking shape and there is a small amount of export. Small- to medium-size, 1-20 kW, wind-powered generators are already in low volume production. We are currently developing 50-200 kW wind-powered generator units. In addition, a 300 t automated assisted-sail vessel has been successfully developed. Research on wind heating is underway. In terms of field applications, more than 120,000 micro wind-powered generators are in use, equivalent to a total installed capacity of approximately 16.8MW. Eleven experimental windmill farms have been built in Xinjiang, Inner Mongolia, Guangdong, Zhejiang, Fujian, and Shandong with a total of 67 medium and large wind-powered generator systems and 6.2MW of total capacity in place. Over 1,600 wind-powered water pumps are in use, corresponding to a total power of approximately 2,100 kW.

3.3 Utilization of Biomass Energy

As of the end of 1992, methane pits were in use in more than 4,982,100 households nationwide. There were 439 methane concentration stations that produce methane by using organic wastes from wineries, sugar mills, domestic animal wastes and food processing plants and supply the gas to more than 73,300 households.

Those pits and stations mentioned above can produce over 1.2 billion m³ of methane per year and provide a clean and convenient fuel for 5,055,000 households (or over 20 million people) across the nation. Besides being consumed as a fuel for daily living needs, methane can also be used in manufacturing. There are 186 methane-powered plants with an overall power of 3,458.5 kW, and 115 methane-burning

electricity generating plants with a total installed capacity of 2,342 kW producing 3,010 MWh of electricity for industrial and agricultural processing plants in the countryside. There are 19,355 methane-producing sewage processing ponds across the country. In addition to providing methane gas for 97,200 households, they also purify the environment and reduce the colititer level and parasite egg settlement rate to meet sanitary standards. Overall utilization of methane gas is also growing rapidly. In 1992, methane gas processing was used in the storage of 219,500 tons of grain, reducing its loss by 25,900 tons and saving 220,000 yuan. Marsh fluid was used to feed 838,700 pigs, saving 529,000 tons of feed. It was used as feed in 465,000 mu of fish ponds, producing an additional 14,413,000 kg of fresh fish and bringing in an extra profit of 43,239,000 yuan. Marsh fluid was used to soak 136,000 kg of rice seeds, increasing crop yield by 37,900 tons. Presently, over 60 percent of the methane users—approximately 3 million rural households—are also engaged in methane-based family enterprises, generating an additional 900 million yuan of income. Experimental studies on biomass gasification and liquefaction are also in progress.

3.4 Utilization of Geothermal Energy

In the area of geothermal energy, the world-famous Yangbajain Lhasa geothermal power plant in Xizang was completed. Its installed capacity is 25MW and has generated close to 400,000 MWh of electricity to date. It produces 40-50 percent of the power in the Lhasa grid and contributes to the economic growth and improvement of quality of life in Xizang. The two 92°C medium temperature geothermal power plants built earlier, i.e., the 200 kW plant in Fengshundengwu and the 300 kW plant in Huitang, have been operating normally for 17 years. China currently ranks fifth in the number of geothermal power generators and 12th in installed capacity among 17 geothermal power generating countries in the world. In the area of low and medium temperature geothermal hot water, more than 20 applications, including bathing, medical treatment, aquatic product breeding, heating, crop breeding, seedling growing, flower and plant growing, vegetable growing, fowl hatching, swimming pools, leather tanning, food processing, silk reeling and fermentation, washing and dyeing, seismic observation and geothermal mineral beverages. According to statistics, there are 1,900,000 m² of geothermal heating, 660 mu of geothermal greenhouse, 630 hot spring baths, 180 hot spring resorts, and 2,520 mu of fish breeding ponds. By the end of 1990, direct utilization of low and medium temperature geothermal heat had reached 7.2×10^{15} J/a.

3.5 Utilization of Ocean Energy

China has built seven tidal power stations and one tidal/flood power plant with a combined installed capacity of 11MW. The Jiangxia tidal power plant has an installed capacity of 3,200 kW and produces approximately 10,000 MWh of power annually. It ranks No. 3 in the world. Small wave-powered generators used as power sources for navigation lights are being deployed. They are being produced in small quantity. Technically, they are among the leaders in the world. Experimental studies on power generation based on ocean temperature differential, salinity differential and ocean currents are being actively pursued and some progress has been made in these areas.

4. Recommendations on Accelerating Development of New Energy Technology

Since developing and utilizing new energy sources is of great strategic significance to China and there are excellent natural resources and a foundation for utilizing such resources, we ought to formulate a plan and take steps to accelerate the development pace. As far as this issue is concerned, the author has the following recommendations.

(1) Organize a team to prepare a comprehensive, practical, and feasible new energy development plan for the next 10 years and incorporate it into the 9th and 10th 5-Year Plans. The plan should focus on the following areas: 1) Solving the energy supply problem in rural areas, particularly providing electricity for daily use in areas that are not yet electrified. This is not only a major economic issue but also an important political problem. To this end, during the 9th 5-Year Plan, a major task in new energy source development is to essentially electrify the vast rural areas by the year 2000 to contribute to our goal to make electricity available in every county and 95 percent of rural households; 2) In the new energy source development plan, the emphasis should be placed on electric power generation. In particular, wind power should be considered as an option in the construction of electric power plants. We should allow the dozen or so medium and large wind farms built over the past decade that have an individual unit power of over 100-300 kW and a total installed capacity of 1,000-10,000 kW to operate in parallel to the power grid to supply a significant amount of electricity to the economy. In solar energy abundant areas such as Xizang, Xinjiang, Ningxia and Inner Mongolia, various forms of photovoltaic power should be developed to supply electricity to a vast area with scattered small loads; 3) Two-thirds of the area in China requires heating. The "three north" regions (i.e., northeast, north, and northwest) are extremely cold and have a long heating season and consume a great deal of energy. In these regions, there are over 3 billion m² of building space in urban areas and every year, an additional 130 million m² of urban residential space and 700-800 million m² of rural residential space is being constructed. The buildings in China consume 217 million tons of standard coal each year, more than 22 percent of the total energy consumption. Approximately 94 million tons of standard coal are used to heat urban buildings in the "Three North" regions alone. This is equivalent to 45 percent of the total energy consumed by buildings nationwide. Passive solar heating can substantially conserve energy. Construction cost can be recovered very quickly. It should be promoted in the "Three North" regions and Xizang; 4) On the basis of the geothermal fields in Yangbajain, Xizang, Tengchong, and Yunnan, geothermal power generation should be actively pursued. New geothermal power plants should be constructed and installed capacity of existing geothermal power plants should be expanded. In areas that are rich in medium and low temperature geothermal resources, direct utilization of geothermal heat should be actively pursued and expanded into other applications. It should be utilized in a comprehensive manner in different stages; 5) Zhejiang is rich in tidal energy. There are a number of ideal sites with large tidal ranges, excellent conditions for utilization, and substantial benefits. Some early stage work has been done. It is recommended that a 500MW tidal power station be built in the 9th and 10th

5-Year Plan each, and 6) Utilization of gasified and liquefied biomass resources and construction of medium and large methane pits and urban sewage treatment methane-producing plants are the directions of biomass energy utilization. These projects should be supported and pursued.

(2) Strengthen scientific research on new energy technology. New energy technology is a supporting technology of the new technology revolution. It is a rapidly advancing high technology and there are numerous issues to investigate, many technical hurdles to overcome, and a variety of products to develop. To this end, scientific research is extremely important. It should be stressed and the level of investment should be raised. On the basis of our actual situation, it is recommended that the following technical issues be given priority: 1) By way of importing, digesting and absorbing foreign technology, we should resolve technical problems associated with the production of 100, 200 and 300 kW windmill power generator systems so that they can be in commercial production as soon as possible; 2) Organize a team to investigate ways to improve the conversion efficiency of single crystal silicon solar cells. We should aim at raising solar cell conversion efficiency to 14-15 percent by the year 2000 in order to substantially reduce the cost of single crystal silicon solar cell; 3) Work hard to overcome the light-induced deterioration problem associated with amorphous silicon solar cells so that they can be used in photovoltaic power plants by the year 2000; 4) Study major problems encountered in geothermal utilization, such as corrosion, recirculation and pollution, so that major breakthroughs can be made as early as possible; 5) Sufficient attention should be given to the research of special materials and equipment needed by new energy sources so that proper arrangements can be made accordingly, and 6) Pursue experimental studies on new technologies, products, and equipment associated with biomass gasification and liquefaction in an attempt to make major breakthroughs before the year 2000.

(3) Take control of new energy industry. Although we have a number of manufacturing companies producing new energy products such as solar hot water heaters, solar stoves, micro windmills and solar cells, most of them are small, low in capacity and technically weak and have outdated production lines. Some may have an imported production line and modern equipment, however, their production volume is adversely impacted by smaller plants. Or, due to duplicated importation, production capacity is greater than market demand, resulting in substantial downtime. In conclusion, China's new energy industry has not taken shape. To accelerate the development of our new energy technology and to allow the utilization of new energy sources to advance in a healthy manner, we should control the growth of our new energy industry. It is recommended that a number of smaller plants with outdated equipment, poor quality products and limited sales be merged or forced out of business through market competition. Plants with modern equipment, high-quality products and good market reception should be supported by key businesses in new energy technology. This will take our new energy production to an industrial scale to continuously improve quality, increase product variety, lower cost and create name recognition to compete in the world arena.

(4) Implement policy to provide incentives for developing and utilizing new energy sources. New energy technology is

still to be investigated, explored and developed as a replacement of existing energy sources. Some of the social benefits are obvious. However, its economic benefits may not be immediately realizable. Many new energy construction projects are going to benefit a large number of people in poor and backward regions. They will help improve and maintain our ecological balance. In order to promote the development of new energy sources, it is recommended that our government, like governments in other countries, actively encourage and support the research, development and utilization of new energy sources by offering incentives in the form of tax reduction, subsidy, low or no interest loans.

(5) Expand international cooperation in various forms through different conduits to gain foreign aid. New energy technology is one of the most active fields in the world. There are numerous academic activities, new papers, new data, new products and new patents. We should expand international cooperation by strengthening academic exchange with foreign countries in order to learn, import, digest, and absorb advanced technology from abroad. We should adapt the strength of others for our own use in order to speed up the development of our own new energy technology to catch up with the rest of the world. Certain international organizations and developed nations, due to different motives and goals, are very concerned about issues such as global energy conversion, global environmental problems and development of poor regions in developing countries. A sizable amount of money is available every year to construct new energy experimental and demonstration projects in developing countries and to aid the construction of new energy projects in poor areas. We are receiving some foreign aid in wind, solar and biomass energy and the results are encouraging. However, compared to countries such as Brazil, India, and the Philippines, China, a country with 1.2 billion people, is getting fewer projects and far less funding. We should liberate our thinking and actively pursue more international aid in various forms through different conduits to promote the growth of our new energy industry.

Central and local government should offer matching funds required by projects receiving international aid.

Asia's Largest Wind Power Field To Be Built in Guangdong

94P60177 Beijing RENMIN RIBAO (OVERSEAS EDITION) in Chinese 17 Mar 94 p 5

[Text] Nan'ao County, Guangdong Province, recently signed an agreement with two American companies to build a 200,000-kilowatt wind power field.

According to reports, after the project has been completed, Nan'ao County—the only island county in Guangdong Province—will become the site of Asia's largest wind power electricity-generating field and an important world center for the development of wind power resources.

A joint investment company formed by the Nan'ao County Wind Energy Development Company and the (Chenjiamin - Kangdena) Company and the Environmental Engineering Corporation of the United States to construct in the central portion of the island a wind power electricity generating field with a total installed capacity of 200,000 kilowatts. The project will take 16 years to complete. The first phase of the project will be completed at the end of 1995 and will supply some 90 million kilowatt-hours of electricity a year.

Nan'ao lies off the eastern coast of Guangdong at the mouth of the Strait of Taiwan. The island is mountainous with abundant wind power resources; the average annual wind velocity is more than 8.5 meters per second and there are 7000 hours of usable wind velocity a year—some of the best wind [energy] conditions in the world. Since 1989, Nan'ao has imported 12 wind power generators from Denmark and other countries for an installed capacity of 1,680 kilowatts. As of the end of 1993, these units had generated 8.8 million kilowatt-hours of electricity.

Nan'ao has been designated a demonstration site for wind energy development by the State Planning Commission and other government departments and is in the State's Eighth Five-Year Plan for new energy resources.

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